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FINAL ENVIRONMENTAL IMPACT STATEMENT

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TWENTYFIVE MILE STREAM WATERSHED



WATERSHED PROTECTION
AND FLOOD PREVENTION

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TWENTYFIVE MILE STREAM WATERSHED PROJECT

Waldo, Kennebec, Penobscot, and Somerset Counties

Maine

FINAL ENVIRONMENTAL IMPACT STATEMENT

Warwick M. Tinsley, Jr., State Conservationist
Soil Conservation Service

Sponsoring Local Organizations:

Waldo County Soil and Water Conservation District
37 Church Street, Belfast, Maine 04915

Town of Unity, Maine 04988

Town of Troy, Maine 04987

Town of Burnham, Maine 04922

December 1975

Prepared by:

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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USDA ENVIRONMENTAL IMPACT STATEMENT ^{1/}

Twentyfive Mile Stream Watershed Project

Waldo, Kennebec, Penobscot, and Somerset Counties

Maine

Prepared in accordance with

Sec. 102 (2) (c) of PL-91-190

Summary Sheet

I. Final

II. Soil Conservation Service

III. Administrative

IV. Description of Action: A project for watershed protection and flood prevention in the Counties of Waldo, Kennebec, Penobscot, and Somerset in the State of Maine to be implemented under authority of the Watershed Protection and Flood Prevention Act (PL-566, 83d Congress, 68 Stat. 666), as amended. The project provides for accelerating the installation of land treatment measures and the construction of structural measures including a box-inlet drop structure, a Type-C drop structure, about 9,500 feet of channel enlargement and realignment, and about 1,500 feet of intermittent clearing and snagging.

V. Summary of Environmental Impacts: Provide adequate land treatment to about 27,300 acres on 100 farm units and 80 non-farm units. Improve hydrologic conditions, cover, water quality, wildlife management practices, quality and quantity of agricultural and forest products, agricultural income, and the standard of living and quality of life for low-income farmers and other watershed residents through better and more efficient use of resources. Decrease highway maintenance costs arising from sedimentation, runoff by about two percent, and soil loss, erosion, and sedimentation by about two-thirds.

Reduce 100-year flood stages up to 5.2 feet and discharges by 1,300 cfs, and by lesser degrees during more frequent floods. Provide flood protection to 163 lake front cottages and homes, 1,700 feet of roads, one bridge, and 1,700 acres of land, thus reducing damages by 90 to 95 percent.

Diversify, create, and/or mitigate for fish, waterfowl, and other wildlife habitat and increase carrying capacities by: diking the cutoff meanders to retain a total of 10 acres of shallow

1/ All information and data, except as otherwise noted, was collected

ponded water; planting and maintaining open areas such as the channel travelway, banks, and spoil disposal areas with foodbearing and/or cover-providing shrubs, legumes, and grasses; reducing areas and frequency of flooding; lowering the water table by about one foot in the vicinity of channel excavation; leaving a one-foot layer of broken rock over a 35,000 square yard area of the channel; excavating fish pools and creating riffles; maintaining the south side of the channel in as near its natural state whenever possible, with large trees left for shade and spoil placed on the north side; and encouraging better submerged aquatic plant growth along the lake shoreline.

Reduce the amount of lake level fluctuation by 2.5 feet, therefore: reducing the amount of shoreline exposed to erosion during flooding; providing better nesting conditions for waterfowl and spawning conditions for shoreline and marsh-spawning fish; preventing exposure of eggs deposited during spring high water; and reducing incidence and degree of well and spring contamination from flooded septic systems, and introduction of nutrients to the lake, thus protecting health and welfare of property owners.

Increase recreational access along the stream with the maintenance road and to the lake with the drop structure maintenance road. Provide additional soils and floodplain information to aid in land use regulation. Increase property values and the tax base. Increase recreation, tourism, and local business. Create 100 man-years of employment valued at one million dollars. Permit greater trafficability, access, and safety on roads once inundated. Publicize remaining flood hazards at least once annually. Restrict development in the 100-year floodplain through the Work Plan Agreement, as well as through new, non-project related environmental legislation.

Reduce in area, change, and/or destroy existing types of fish, waterfowl, and/or other wildlife habitat by: selectively clearing and snagging 1,500 feet of existing channel; constructing 9,500 feet of a combination of new and enlarged channel; using 11.1 acres of Type 7 wetland for channel and drop structure construction; shortening the channel by 3,200 feet; reducing area and frequency of flooding; lowering the water table by about one foot in the vicinity of channel excavation; and the possible loss of 40 acres to cottage development.

Loss of some fish and wildlife during construction. Increase traffic density, road deterioration, and noise, air, and water pollution (turbidity from sediment) during construction, during new cottage development, and as a result of increased tourism and recreation. Alter the appearance of the natural channel. Restrict recreational boating due to the drop structures and shallower water. Increase costs of town services to the area. Commit funds, energy, material, and labor precluding their use for other projects.

VI. Alternatives Considered:

Alternative 1 - No project

Alternative 2 - Land treatment

Alternative 3 - Land treatment, relocation of existing cottages,
and floodplain zoning

Alternative 4 - Land treatment and floodwater retarding structures

Alternative 5 - Land treatment, floodway, and channel excavation

Alternative 6 - Land treatment and floodway adjacent to Twentyfive
Mile Stream

VII. Federal, State, and Local Agencies from which comments were
received:

Advisory Council on Historic Preservation

Federal Power Commission

U. S. Department of Agriculture, Agricultural Research Service,
N. E. Plant, Soil, and Water Laboratory

U. S. Department of Agriculture, Farmers Home Administration

U. S. Department of the Army, Office of the Assistant Secretary

U. S. Department of Health, Education, and Welfare

U. S. Department of the Interior, Bureau of Outdoor Recreation

U. S. Department of the Interior, Geological Survey, Water Resources
Division

U. S. Department of the Interior, Office of the Secretary

U. S. Department of Transportation, U. S. Coast Guard

U. S. Environmental Protection Agency

Governor of Maine

Maine Department of Conservation, Bureau of Parks and Recreation

Maine Department of Environmental Protection, Commissioner

Maine Department of Environmental Protection, Bureau of Land
Quality Control

Maine Department of Environmental Protection, Bureau of Land Quality
Control; Enforcement Division

Maine Department of Inland Fisheries and Game

Maine Department of Health and Welfare

Maine Department of Transportation, Bureau of Planning

Maine State Historic Preservation Officer

Kennebec Valley Conservation Association

North Kennebec Regional Planning Commission

State Biologists' Association

VIII. Draft statement transferred to the Council on Environmental
Quality on January 18, 1975.

USDA SOIL CONSERVATION SERVICE

FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR

TWENTYFIVE MILE STREAM WATERSHED

WALDO, KENNEBEC, PENOBSCOT, AND SOMERSET COUNTIES, MAINE

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATIONS

Waldo County Soil and Water Conservation District;
Town of Unity;
Town of Troy;
Town of Burnham

PROJECT OBJECTIVES AND PURPOSES

As originally stated in the application, the Sponsors' primary objective is watershed protection and flood prevention. In order to solve or alleviate most of the watershed problems, the Sponsors of the watershed project agreed to the following objectives:

1. Land treatment will be applied to those lands in need of conservation practices. Land treatment measures will improve production and management and will provide a basis for farmers in the low-income category to improve their economic status, reduce erosion, soil loss, and potential animal waste disposal problems, provide for drainage, and improve forest hydrologic conditions.
2. A 100-year level of flood protection will be provided to lake shore properties, recreational developments, and rural homes on Lake Winnecook. A 5-year level of flood protection will be provided to agricultural land below Prairie Road, and a 30-year level of protection will be provided to roads and bridges downstream from Lake Winnecook.
3. Preservation and improvement of existing fish and game resources will be emphasized by assisting landowners in developing and installing a conservation plan. The structural measures will be coordinated with the Maine Department of Inland Fisheries and Game and the U. S. Fish and Wildlife Service.
4. Accelerate the standard soil survey and flood plain information studies to provide basic resource information for making land use and zoning decisions. This will provide the necessary information to plan for new development and alleviate potential pollution problems stemming from septic tanks.

PLANNED PROJECT

Land Treatment

The purpose of land treatment is to provide protection to land which is presently subject to erosion and other problems. The physical characteristics of the soil also will be improved, thus providing for greater infiltration and percolation rates, increasing water storage capacity, and reducing runoff. These measures complement the structural works of improvement and help to bring about the realization of the project objectives and assure project benefits.

The land treatment phases of this plan include adequate treatment of 2,282 acres of cropland, 7,842 acres of grassland, and 17,200 acres of forestland. The purpose of this land treatment program is to provide multiple-use management and direction to the landowners and to protect and improve the resources of the watershed through land and water conservation practices. The planned treatment of 27,324 acres will be composed of applicable soil and water conservation practices. The planned treatment of cropland includes diversions, conservation cropping systems, contour farming, crop residue management, ponds, obstruction removal, grassed waterways, and tile drains. For grassland, the practices include pastureland and hayland management, brush control, wildlife habitat development, pastureland and hayland renovation, and ponds. Forestland practices include tree planting, managed tree harvesting and improvement cuts, and erosion control of skid trails and logging roads. The planned agricultural waste management practices will entail the

disposal of manure by spreading and recycling it through various crops based on the Maine Guidelines for Manure and Manure Sludge Disposal On Land. Pits and selected sites will be used to store the manure during the winter months.

Technical assistance for planning and application of these measures, normally available through on-going conservation programs, will be continued at the rate that existed prior to the development of this plan and include technical services to be provided by the Soil Conservation Service and by the Maine Bureau of Forestry in cooperation with the U. S. Forest Service. Thirteen man-years of additional technical assistance is planned through the use of PL-566 funds to accelerate the rate of application of land treatment. The soil survey mapping is scheduled to be completed by November 1978 in Waldo County.

Technical assistance is involved in (a) stimulation of landowner interest and participation in the watershed program; (b) general planning, supervision, and inspection of the land treatment phase of the program; and (c) assistance to individual landowners in installing the measures on their land.

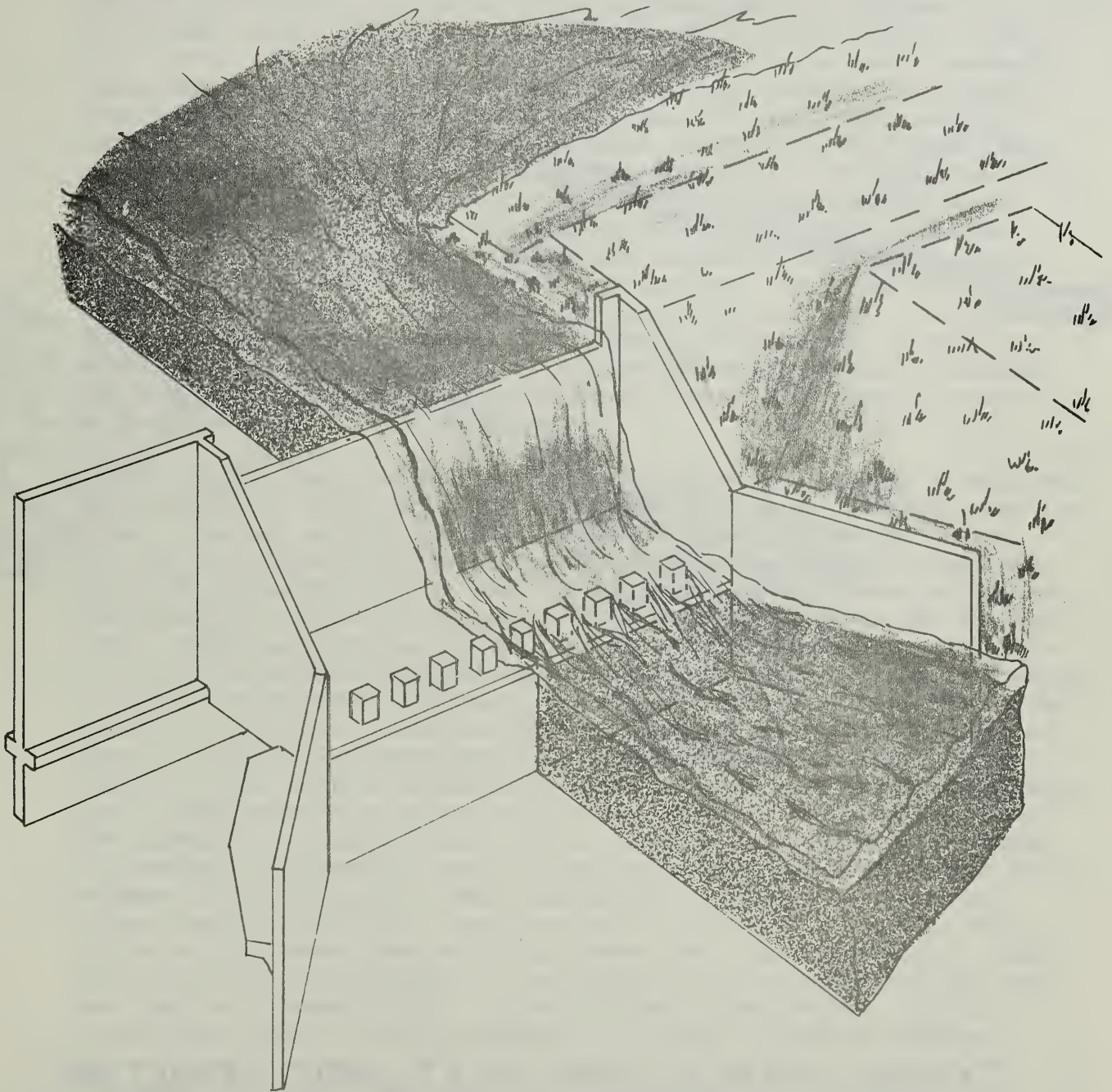
Structural Measures

The structural system selected was found to produce the desired results at least cost with an acceptable disturbance to the natural environment. It consists of 1,500 feet of intermittent clearing and snagging in a 3,400-foot reach of the outlet channel of Lake Winnecook, a Type C drop structure 3,400 feet below the lake, a box inlet drop structure with provisions for a bridge at Prairie Road, 9,500 feet of channel realignment and enlargement, and fills placed on the upstream and downstream end of four cutoff meanders.

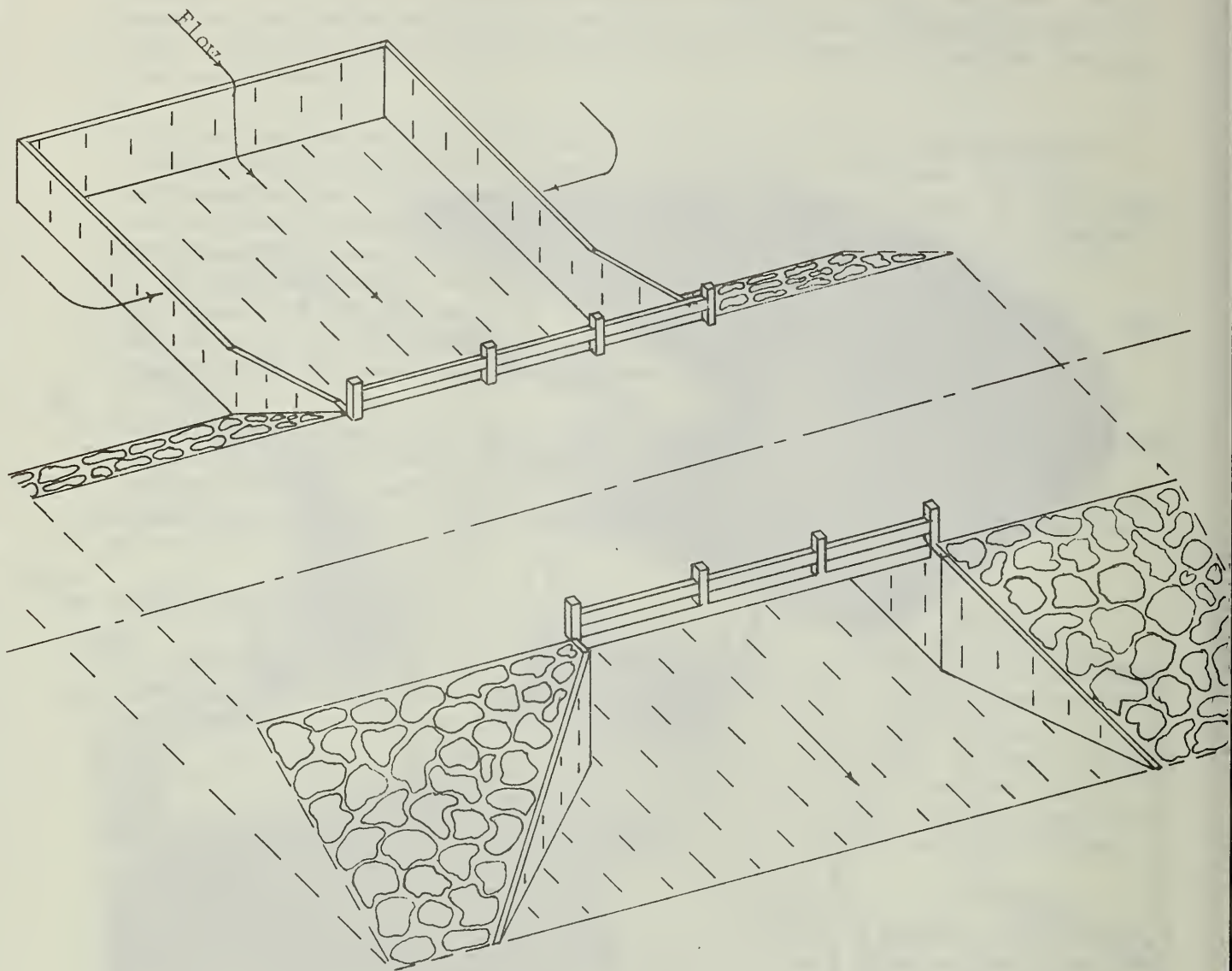
Selective clearing and snagging will be performed on about 1,500 feet of the 3,400-foot-long Twentyfive Mile Stream channel between Lake Winnecook and Prairie Road. This work will consist of removing selected trees, logs, stumps, debris, and brush necessary to improve the flow characteristics of the existing channel.

A Type C drop structure with a weir length of 100 feet and a drop of 5.0 feet will be installed in Twentyfive Mile Stream channel about 3,400 feet downstream from the lake. The structure will consist of about 120 cu. yds. of reinforced concrete on a foundation of deep sands and silts.

A combination box inlet drop structure and bridge with an approximate total weir length of 82 feet, a drop of six feet, and peak design capacity of 5,780 cfs will be installed in Twentyfive Mile Stream about 4,000 feet downstream from the lake. The structure, including the bridge, will consist of 435 cu. yds. of reinforced concrete and be constructed on firm soil or bedrock, if placed in the same location as the present bridge. Seismic hazard has been considered in the design of both concrete structures.



TYPICAL VIEW OF A TYPE C DROP STRUCTURE



TYPICAL VIEW OF BOX INLET DROP STRUCTURE

Twentyfive Mile Stream below Prairie Road will be straightened and enlarged for a distance of 9,500 feet. The channel will have a bottom width of 100 feet, an average depth of 10 feet and a design capacity ranging from 6,600 to 6,850 cfs. Bedrock is generally shallow along most of the channel. Deposits of marine sand and silt generally overlay the bedrock with till or outwash located intermittently beneath them. The channel bottom will be cut into rock at six intermediate reaches along the channel. Located between the bedrock reaches are pockets of interlayered sand and silt and gravelly glacial till. The pockets between the rocks will be excavated about two to four feet below grade to serve as pools for fish. The reaches of bedrock will assure a stable channel bottom and are expected to maintain the channel pools below them. During construction, the bedrock surface will be drilled and blasted about one foot below the desired channel grade. The one-foot layer of broken rock will be left in the channel bottom and it is expected that this area of about 35,000 square yards will serve as a food-producing area for the fishery resources of Twentyfive Mile Stream. It will not serve as brook trout nursery area because of shallow water, low flows, and high summer temperatures; warm water fish will use deeper areas as nursery areas.

Spoil will be placed on the north side of the stream channel as much as practicable; in addition, large trees will be left on the south side for shade. Channel side slopes will be 1 to 1 or steeper in rock cuts through the reaches where widening of the existing channel is planned. The rock overburden will be used for riprap to prevent undercutting and ensure stable side slopes in areas where the channel banks are silt and sand. Only one existing bank will be disturbed, wherever possible, in an effort to protect fish and wildlife values. All oxbows will be diked on the upstream side. The lower end of the meanders will be blocked by placement of surplus excavated rock to form low dikes which will retain water in part of the older meanders during times of low flow. These dikes or sills will be designed to allow spillage back into the meanders during high water periods and retain this water at times of low flows. The dimensions of these sills will be variable but will be high enough to inundate, if possible, most of the backwater areas (two to four feet appears to be adequate). Two sills will be installed on the large oxbow, located 3,000 feet downstream of Prairie Road. One sill will be placed on the downstream end of the oxbow, and one approximately 1,500 feet upstream in the meander. The heights of these sills will be three and two feet, respectively. All activities in the project will be coordinated with the Maine Department of Inland Fisheries and Game.

The spoil from the channel work will be disposed of to open up the woodlands and create diversity in the habitat conditions. This spoil will be placed in piles about 150 feet apart along the streambank. The piles will then be leveled in a zig-zag pattern away from the streambank for about 200 feet in length and 50 feet in width.

Additional spoil will be piled between the lateral bands on the streambank and the oxbows to serve as nesting and resting islands. The size

of the islands will approximate 10 square feet at the crown and rise 2 to 4 feet above maximum high-water level. All of these areas will be seeded with appropriate grass, legume, and shrub mixtures of proven value to wildlife. The specific locations for these will be coordinated with the Maine Department of Inland Fisheries and Game to insure proper placement of spoil and minimum disturbance to surrounding areas.

Settling basins or silt traps will be placed downstream of all proposed channel excavations. The excavation will start upstream and proceed downstream. The current will flush disturbed material into the traps. Blasting of rock ledges and excavation of the gravel pockets will proceed in a similar manner.

The selective clearing and snagging, the Type C drop structure, the bridge box inlet structure, and the channel improvement are all interrelated and interdependent and function as a floodwater retarding structure. Each work of improvement plays a part in controlling the discharge of Lake Winnecook. The selective clearing and snagging of trees and debris above the drop structure will improve the flow characteristics of the floodwaters entering the Type C drop structure from the lake and will ensure the same water elevations in the lake as at the structure. The Type C drop structure and bridge box inlet structure with long weir lengths will provide for larger discharges to occur with relatively low heads. If the clearing and snagging and the Type C drop structure were the only elements planned in the floodwater retarding structure, the Type C drop structure would rapidly become submerged and all of its flood retention effects would be eliminated. The function of the Type C drop structure as planned will be to control the lake's discharges from its crest elevation at 173.5 feet msl to an elevation of 174.1 feet msl or flood discharges ranging from 0 cfs to about 1,000 cfs.

The function of the bridge box inlet structure as planned will be to control the discharge of Lake Winnecook from an elevation of 174.1 feet msl to 176.0 feet msl or flood discharges ranging from 1,000 cfs to about 3,600 cfs. The channel starts controlling the bridge box inlet structure at a discharge of 1,150 cfs and ultimately controls the Type C drop structure at elevations above 176.0 feet msl or discharges greater than 3,600 cfs. Prairie Road will remain at its present elevation to assure proper lake level control since it acts as a weir and is an integral part of the bridge box inlet structure.

The interaction of the lake outlet structures has the effect of increasing the discharges of Lake Winnecook over present conditions for all events less than the 1-year storm. The system, as planned, will improve lake outlet conditions for lower stages to save storage for high volumes of flow. The peak discharges downstream from the channel improvement will be more than presently experienced for all events smaller than the 1-year storm and less for all greater storms. The table below shows an array of peak discharges at the present lake outlet and at the proposed channel outlet for both present and future conditions.

Frequency	Lake Outlet			Channel Outlet		
	Discharge (cfs)		% change	Discharge (cfs)		% change
	Present	Future		Present	Future	
1 year	1200	1200	0	1220	1220	0
5 year	3360	2780	17.3	3500	2800	20
10 year	4340	3600	17.1	4500	3650	18.9
25 year	5600	4726	15.6	5825	4896	15.9
100 year	7800	6600	15.4	8080	6833	15.4

The floodwater retarding structure will control 129.7 sq. mi. of drainage area and provide temporary flood storage for 1.7 inches of runoff or 11,700 acre feet. The estimated sediment inflow of 1,000 ac. ft. over the next 100 years, can be stored in the lake without serious impairment of its capacity. The Type C drop structure and box inlet drop structure will, in operational sequence series, serve as principal and emergency spillway for the lake.

The design of the drop structures and channel improvement will enable passage of the 100-year flood with lake stages below significant damageable values around the perimeter of the lake, and provide the desired level of protection downstream. The design elevations of the bridge and capacity provided in the structural system will allow passage of the freeboard hydrograph below the floor of the bridge on Prairie Road. The Type C drop structure will stabilize the lake level and prevent the stream from degrading below the lake's lowest natural outlet.

A review of the National Register of Historic Places and interviews with local residents indicated that no known archaeological or historical values will be affected. A review of the project by Mr. James H. Mundy, Maine State Historic Preservation Officer, indicated that the project will have no impact upon any structure or sites listed in the National Register of Historic Places or eligible for such designation. A survey of the local area by Dr. David Sanger, University of Maine Anthropologist, revealed no archaeological sites. Should discoveries be made during construction, work will be stopped and appropriate authorities will be notified. Work will not resume until the discovery has been examined by competent authorities, arrangements satisfactory to the sponsors, the Service and the authorities have been made, and the agreed-to-actions implemented.

Nonstructural Measures

Included in the nonstructural phase of this plan are land use planning and flood plain management. As a result of the completed soil survey, and production of flood plain delineation maps, the towns will have the basic tools necessary to establish land use regulations in the watershed. The towns currently are responsible for the approval of all new developments adjacent to all classified bodies of water in accordance with the mandatory Shoreland Zoning Law as adopted by the State of Maine Legislature. The Shoreland Zoning Law requires that the towns must zone all land within 250 feet of normal high water mark on all classified bodies of water. In addition, the towns will ensure that all developments are in accordance with the State of Maine Plumbing Code, which specifies the type, location, and conditions for installation of septic systems.

Land Use Changes

The relocation and enlargement of the channel will require about 10 acres of Type 7 wetland and the placement of the drop structure will require about one acre of Type 7 wetland.

As a result of the project, it is estimated that approximately 40 acres of forest land around Lake Winnecook, currently available for wood production and wildlife habitat, will be lost by the future use of the area for cottage development.

Operation and Maintenance

Land Treatment

Land treatment measures will be maintained by landowners and operators where such measures are installed. These measures are provided for in the owner's or operator's conservation or forest land plan under agreement with the four local Soil and Water Conservation Districts and the Maine Bureau of Forestry. The State of Maine and the local municipalities will operate and maintain the measures installed on State and municipal forest lands.

Structural Measures

All structural measures will be operated and maintained by the Town of Unity. The Town of Unity has the legal authority under state law to operate and maintain works of improvement as proposed in this plan. Funds necessary will be appropriated from local tax revenues.

All structural works of improvement will be inspected at least annually and after every major storm or the occurrence of any unusual adverse conditions that affect their operation. Items of inspection of each structure will include, but not be limited to, the condition of the spillway and fences and gates installed as part of the structure. Items of inspection on the channel will include, but not be limited to: location of erosion; the condition of the vegetative cover and riprap; and the need for control of vegetation to prevent any reduction of the capacity of the channel by debris and sediment accumulation. The inspection will involve representatives of the Town of Unity, the Waldo County Soil and Water Conservation District, the Soil Conservation Service, and the Maine Department of Inland Fisheries and Game.

These inspections will continue for three years following the installation of works of improvement. Inspections after the third year will be made annually by the sponsors. They will prepare a report and send a copy to the Soil Conservation Service.

Maintenance work likely to be required consists of keeping the spillways free of trash, riprap on the channel work, and proper vegetation on the channel banks and spoil disposal (wildlife planting) areas. Operation and maintenance includes such major repair and replacements as are necessary to keep the project functioning as planned.

The annual operation and maintenance cost for the structural measures is estimated to be \$1,100. This consists of \$800 for the channel, \$200 for the box inlet drop structure, and \$100 for the Type C drop structure.

Specific operation and maintenance agreements must be executed prior to the signing of the project agreement, which is the fund authorizing document for each contract. The operation and maintenance agreement is an agreement entered into by the Soil Conservation Service and those sponsors who assume full responsibility for providing adequate and sound arrangements for proper operation, timely inspection, and prompt and appropriate performance of needed maintenance. The operation and maintenance agreement will be referenced to the State Watersheds Operation and Maintenance Handbook, and an operation and maintenance plan will be prepared for each work of improvement. The operation and maintenance agreement will include specific provisions for retention and disposal of property acquired or improved with PL 566 financial assistance.

Project Costs

The installation cost of land treatment measures is estimated to be \$747,700 of which \$281,800 is for technical assistance. Public Law 566 funds will bear \$266,200 of the technical assistance cost and \$15,600 will be borne by other funds. Land treatment measures borne by other than PL 566 funds are estimated to be \$465,900.

The estimated installation cost of the structural measures is \$867,000. Public Law 566 funds will bear \$856,000 of this amount. Local funds will bear the remaining cost of \$11,000 for landrights and project administration. The total estimated installation cost of both the land treatment and structural measures is \$1,614,700.

The local sponsors will provide landrights and pay the project administration costs they incur. The landrights cost, project administration cost, and the annual operation and maintenance costs are estimated to be \$5,000, \$6,000, and \$1,100 respectively. The sponsors will provide the nonproject cost associated with Site 1 estimated to be \$46,000.

The sponsors will bear costs that they incur by means of local tax revenues.

Prior to entering into agreements that obligate funds of the Service, the sponsors will have a financial management system for control, accountability, and disclosure of PL 566 funds received, and for control and accountability for property and other assets purchased with PL 566 funds.

Program income earned during the grant period will be reported on the sponsor's request for advance or reimbursement from the Service.

ENVIRONMENTAL SETTING

Physical Data

The Twentyfive Mile Stream Watershed, primarily located in the northwestern part of Waldo County, Maine, has a drainage area of 92,637 acres (144.7 square miles) and is a portion of the Kennebec River Basin. The watershed encompasses portions of Kennebec, Somerset, and Penobscot Counties and includes parts of the townships of Burnham, Detroit, Freedom, Knox, Montville, Plymouth, Thorndike, Troy, Unity, and Unity Plantation. The watershed is located in the central part of the state about 35 miles northeast of Augusta, 33 miles southwest of Bangor, and 200 miles northeast of Boston.

The watershed is within the St. Croix Water Resource Planning Area, as identified by the Water Resources Council.

Soil and water resource problems occur around the periphery of Lake Winnecook when flooding inundates seasonal cottages and permanent homes. Flooding problems also occur downstream from the lake, and include 180 acres of agricultural land, one and one-half miles of road, and three bridges. The present 100-year flood plain identified in the project area covers about 1,700 acres.

The Twentyfive Mile Stream Watershed lies within the coastal lowlands section of the New England Physiographic Province of the Appalachian Highlands. This region has been affected by at least the last major advance of continental glaciation. The soils are derived from glacial drift (till and outwash) which was deposited during the last glacial age. Following the retreat of continental glaciation which completely covered this region, the lowlands were subject to marine submergence up to at least the present elevation of 300 feet, and then the present land mass was uplifted above sea level. As a result, the surficial geology is a combination of glacial processes, marine sedimentation, and post uplift erosion. Deposits from the glacial processes are complexly interfingered with marine and estuarine deposits.

The watershed can be divided into two relatively different topographic areas. The area east and southeast of Lake Winnecook is typified by rolling hills up to an elevation of 960 feet. The area west of Lake Winnecook is a low flatland area with a maximum elevation of 300 feet.

The soil types distributed through the two topographic areas vary as a result of different parent materials and environment of formation. The eastern and southeastern areas are dominated by glacial till; however, there are other parent materials such as glacial outwash and recent stream deposits. The following soils found in the area are derived from glacial till parent material but vary from each other in thickness and drainage: Thorndike, shallow, excessively well-drained, located on slopes and tops of rolling hills; Dixmont and Sutton, deep, moderately well-drained, located on gentle-to-rolling slopes; Monarda and Leicester,

deep, poorly drained, located in depressions and near streams. Other soils in this area, but of limited extent, are Windsor, Deerfield, Hartland, and Belgrade, located on glacial outwash deposits, and Limerick, located on recent alluvium.

The geologic history of the area to the west of Lake Winnecook differs from the eastern area. The post-glacial marine inundation of the western area left widespread fine-grained deposits at the lower elevations. The hills, however, are mantled with glacial till similar to that which exists in the eastern area. The Dixmont and Monarda soils have developed on these till areas and their characteristics are as previously described. The fine grained marine deposits located in the flat lowlands are the parent material for Scantic soils which are deep and poorly drained. Modern alluvial processes have produced more widespread deposition of alluvium in the western area than in the eastern area. These deposits form the parent material for Limerick soils which are deep, poorly drained, and located in the lowlands adjacent to major drainageways.

The Thorndike, Dixmont, Limerick, and Scantic soils occupy about 70 percent of the surface area of the watershed. The Sutton and Deerfield soils occupy 16 percent, and Monarda soils occupy the remaining 10 percent. Four percent of the surface area is water. The bedrock geology consists of one major undifferentiated, unnamed rock unit. It is composed of altered (metasedimentary) calcareous rocks. These rocks are slate and quartzite which have been intensely deformed and folded.

A summary of earthquake data in "Earthquake Hazard in Eastern United States," by B. F. Howell indicates that earthquakes have not been frequent or intense in the northeastern United States. Twentyfive Mile Stream is within Howell's "Region of Transient Hazard". The Appalachian Physiographic Region has an Average Cumulative Seismic Hazard Index of 7.34. A low hazard index is considered less than 5.4, the threshold of damage. More than 7.55 is considered high, the level where appreciable damage to normal construction is common. According to Fox in "Seismic Geology of the Eastern U. S.", this area falls into a Class "C" region, a region of relatively numerous epicenters, some damaging shocks, major structural features and/or proximity to areas which have devastating shocks. No major shocks have been reported in Maine over the last 70 years.

The large quantities of sand and gravel are the only geologic deposits of major economic importance. There are no known mineral deposits of commercial interest. The large quantities of water retained within the glacial outwash deposits offer excellent sources of water for domestic and commercial purposes.

The watershed has a modified continental-type climate with long, cold winters and mild summers. The normal growing season is 135 days extending from May 15 to September 27. The average yearly precipitation is 40.0 inches which is distributed fairly uniformly throughout the year. Snowfall averages 78 inches annually. The average monthly temperature ranges from 20 degrees in January to 68.5 degrees in July.

The present land use and cover is mostly forest which makes up about 79 percent (73,344 acres) of the watershed area. It has been determined that approximately 30 percent of the forest land is in a below average condition to retain runoff. The condition is expected to improve with the current level of fire protection and more intensified woodland management. The remainder of the watershed area consists of about 17 percent (15,415 acres) crop and grass land, and four percent (3,878 acres) lakes, ponds, and streams. Cover conditions for these lands range from fair to good. Land use in the soil and water resource problem areas falls into three categories: recreational and permanent homes, agriculture, and forest land.

Present forest stands, occupying 79 percent of the watershed area, consist of 46 percent northern hardwood type (beech-birch-maple); 36 percent softwood type (spruce-fir); and 18 percent mixed type (spruce-fir-northern hardwoods). About 54 percent of the forest stands are pole size, 5 percent are saw timber size having more than 1,500 board feet per acre, and 41 percent are in stands consisting of seedlings and saplings. Along Twentyfive Mile Stream below Prairie Road the vegetative cover is primarily elm, red and silver maple, ash, and alder. Undercover is composed of rather dense stands of red osier, silky cornel dogwood, viburnums, brambles, and weedy growths such as aster, goldenrod, beggar tick, hellebore, and various native grasses.

The watershed is comprised of a number of streams and brooks which flow into Lake Winnecook. Carlton Stream originates in the northern portion of the watershed at Carlton Pond and flows in a southerly direction into Lake Winnecook. Sandy Stream, the major tributary, starts in the southern portion of the watershed at Sandy Pond and flows in a northerly direction through the towns of Freedom and Unity and finally into Lake Winnecook. Twentyfive Mile Stream, originating at the outlet of Lake Winnecook, flows in a northwesterly direction for about five miles and joins the Sebasticook River at Burnham Village. The outlet and the major inlet of Lake Winnecook are near the same location. Stream gradients are low to moderate in the northern and western portions and are moderately steep in the southern and eastern portions of the watershed. Except for a short section of Sandy Stream, all streams are perennial and have well-defined natural channels. Sandy Stream, from Route 202 for several hundred feet downstream, was modified in the 1800's. No records were found to describe the kind and extent of changes that were made. The average sustained low flow that can be expected from Twentyfive Mile Stream is 23 cfs for a 30-day period, 32 cfs for a 60-day period, and 39 cfs for a 90-day period.

Lake Winnecook (2,230 acres) is the largest body of water in the watershed. (See Bathymetric map of Lake Winnecook). The lake depth and temperatures classify it, according to Maine Department of Inland Fisheries and Game Standards, as a warm water lake. This means that it is not conducive to the propagation of a salmon or trout fishery. The maximum depth of the lake is 41 feet. The summer temperatures range from 78° F. at the surface to 60° F. at 37 feet. The lake shoreline is about 11.6 miles long. Other ponds include Carlton Pond (430 acres), Sandy Pond (430 acres), and several smaller ponds and flowages.

LAKE WINNECOOK

Bathymetric Map

(soundings in feet)



The quality of fresh water in the watershed has been classified according to standards established by the Maine State Legislature. The classifications were defined by the Maine Department of Environmental Protection after a state-wide sampling program was completed. The classification of a particular body of water indicates the minimum quality level that is acceptable. The following table presents the quality standards for several levels of classification:

STATE OF MAINE

WATER CLASSIFICATION STANDARDS

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Classification	B-1	B-2	C
Dissolved oxygen <u>1/</u> , <u>2/</u>	75%/≥ 5ppm	60%/≥ 5ppm	≥ 5ppm
Total coliform bacteria <u>3/</u>	≤ 300	≤ 1000	≤ 5000
Fecal coliform bacteria <u>3/</u>	≤ 60	≤ 200	≤ 1000
pH	6.0 - 8.5	6.0 - 8.5	6.0 - 8.5

1/ percent saturation

2/ parts per million

3/ number per 100 ml.

Class "B-1" water shall be the highest quality of the Class B group and shall be acceptable for recreational purposes, including bathing, for use as a potable water supply after treatment, and for fish and wildlife habitat.

Class "B-2" water shall be acceptable for recreational purposes including bathing, for industrial and potable water supply after adequate treatment, and for fish and wildlife habitat.

Class "C" water shall be of a quality as to be satisfactory for recreational boating and fishing, for fish and wildlife habitat, and for other uses except potable water supplies and swimming, unless such waters are adequately treated.

The following fresh waters in the watershed are classified as Class "C": Carlton Stream and tributaries, and Sandy Stream, main stem, from the outlet of Sandy Pond to its junction with Halfmoon Stream, and from its junction with Bacon Brook to a point one-half mile above the entrance of Mussey Brook. Lake Winnecook is classified as Class "B-1". All other tributaries and streams in the watershed are classified as Class "B-2".

The Maine Department of Inland Fisheries and Game has completed a wetlands inventory in this area. The following table outlines the results of the study which identifies the wetlands of the watershed in accordance with Circular-39, "Wetlands of the U. S.", U. S. Department of the Interior.

Type:	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	Comb. <u>4 & 6</u>
Acres:	297	67	1053	2787	153	300	230

The following areas are significant in acreage: Twentyfive Mile Stream downstream from Route 139, Type-6, 140 acres; Twentyfive Mile Stream downstream from Prairie Road, Type-7, 300 acres; Bithers Brook, Type-2, 152 acres; Carlton Stream, Type-2, 108 acres; Carlton Pond, Type-4, 860 acres; Twentyfive Mile Stream between Prairie Road and the railroad tracks, Type-4 and Type-6, 230 acres; and the northern end of Lake Winnecook, Type-5, 120 acres.

Present and Projected Population

Unity, the largest town in the watershed, was incorporated in 1804, and was first settled as "Twentyfive Mile Pond Plantation". The population was 1,557 in 1850, but declined to 877 in 1900. Since 1900, the town has shown a slow, steady growth to its present population of about 1,200. There are approximately 3,800 people living in the watershed. The 1972 OBERS projections for the Bangor economic area predict approximately a nine percent population increase for each ten-year period through 2020.

Economic Data

The watershed is within OBERS Bangor Economic Area. Per-capita income relative to the national average was 0.76 in 1970. The watershed is characterized as a low-income area.

Land ownership in the watershed is privately held except for about 2,885 acres of public land. The town of Troy controls about 1,350 acres of forest land. The State of Maine administers approximately 1,500 acres in the vicinity of Frye Mountain as a game management area located on the southern watershed divide and a five-acre boat access site on Sandy Stream. Unity has 30 acres in public ownership.

The balance of the forest land is held by an estimated 175 private owners. Carlton Pond and adjacent areas, involving about 1,800 acres, are managed by the U. S. Fish and Wildlife Service as a waterfowl production area. All major roads are publicly owned.

The watershed is accessible by federal, state, and town highways. U. S. Route 202 passes through the town of Unity and the central portion of the watershed. A number of state highways run through the watershed. A network of rural roads serves farms and woodlots in the watershed. There are no commercial air transportation facilities in the watershed; however, Augusta, about 35 miles to the southwest, and Bangor, about 33 miles to the northeast, offer these facilities. Railroad freight service is provided by the Belfast and Moosehead Lake Railroad.

Unity Institute was established in 1966 with 38 students; it is now Unity College and has a four-year program and degree granting privileges which began with the Class of 1970. The present enrollment of Unity College is 300 students.

The economy of the watershed is based primarily on agriculture, forestry, and associated industries. Agricultural and wood product processors and manufacturers are the basic industries in the town of Unity. According to the 1968 Census of Maine Manufacturers, the value of production for Unity industries was \$1,171,934; gross wages paid were \$377,663. The average gross wage was \$3,174 per worker.

Employment in agriculture and forestry during the past 20 years has decreased by more than one-half in the Bangor Economic Area. The trend is expected to continue at a lesser rate in the future.

There are about 420 farms scattered throughout the watershed of which approximately 145 are full-time farms. The average-sized farm is approximately 200 acres. According to the 1969 Census of Agriculture, the average value of land and buildings per farm was \$39,000 in Waldo County. The average value per acre of cropland is about \$225 and the average value per acre of woodland is about \$75. The average gross sale of farm products for farms with over \$2,500 in sales is \$38,000. The number of farming units has been decreasing and the size of farms has been increasing in the watershed area. The number of farms in Waldo County has decreased from 942 in 1964 to 517 in 1969. Cropland acreage in Waldo County has decreased from 43,000 acres to 31,000 acres. Some financially marginal dairy enterprises are converting to poultry.

Over 95 percent of the farms in the watershed are family farms. Farm units in the low-income category (gross sales of less than \$20,000) comprise about 35 percent of the farms. Twenty-five percent of the farm units are below the poverty level net income of \$4,000.

Local markets are good for cedar, hardwood and softwood pulp, saw-logs, Christmas trees and greens, boltwood (birch and maple), and maple syrup products. Gray birch is utilized in a speciality market. The market for aspen is poor.

The average value of cottages on Lake Winnecook is estimated to be \$6,000. Shorefront lots average \$60 per front foot. Urban land in Unity averages \$2,000 per acre.

Under the Public Works and Economic Development Act of 1965, this watershed is within the area designated as the "New England Economic Development Region".

Fish and Wildlife Resources

Warm and cold water fisheries exist in the watershed. Lake Winnecook provides a warm water habitat. Smallmouth bass, largemouth bass, chain pickerel and white perch provide the largest populations of game fish species in the lake. The lake also supports an abundant population of American smelt. Spawning areas for the game fish species occur along the shoreline.

Halfmoon Stream is an excellent natural brook trout stream. Sandy Stream is also a good brook trout stream from the point of its confluence with Halfmoon Stream downstream to Lake Winnecook. Both Halfmoon Stream and Sandy Stream are stocked irregularly with brook trout to augment the existing natural populations of these fish.

A fisheries survey was made on Twentyfive Mile Stream by the Maine Department of Inland Fisheries and Game in July 1964. The fish population was a mixture of cold and warm water types. In order of relative abundance, the species are: golden shiner, fall fish, bullhead, chain pickerel, white sucker, yellow perch, smallmouth bass, and brook trout.

An electrofishing survey was made by the Maine Cooperative Fisheries Unit in November 1975. No salmonoids were seen during this survey. The latest survey report is attached as Appendix E.

The only fish stocked are brook trout. This stocking is not part of a regular stocking program, but rather is done intermittently as fish are available. The stream supports a fair early season brook trout fishery--summer flows and temperature are the limiting factors.

The Twentyfive Mile Stream habitat is primarily suited for warm water fish. The bottom consists of a mixture of rubble, sand, and several large boulders. The pool to riffle ratio is 1:1. Cover is excellent for two miles below Prairie Road and good to excellent from that point to the Sebasticook River. Water quality in July 1964 was recorded as follows: Temperature = 70° F., Dissolved oxygen = 8 parts per million, pH = 6.7 to 7.0. The stream contains good to excellent spawning conditions for smallmouth bass and pickerel from Prairie Road to the Sebasticook River.

The large Type-4 wetland area, between Prairie Road and the railroad bed, is vegetated primarily by bulrush-bluejoint and is ideal duck habitat. There is some cattail marsh suitable for ringnecked ducks. Much of the area is in shrubby cover such as sweetgale (*Myrica gale*), button-bush, leather leaf, and other typical northern swamp species. Woodlands occupy the slightly higher elevations and the species are elm, black and brown ash, and silver and red maple. Trees on the thin margins between swamp and upland benefit both waterfowl and game. There is fair-to-excellent woodcock cover, depending upon the stage of succession on the old hayfields, adjacent to the present stream. Woodcock, ruffed grouse, white-tailed deer, snowshoe hare, fox, raccoon, otter, and skunk are the chief wildlife species inhabiting the watershed area. The Sebasticook River provides habitat for waterfowl, particularly black duck, wood duck, teal, and goldeneye.

No known rare or endangered wildlife species utilize the watershed.

Recreational Resources

There is one commercial marina and campground on Lake Winnecook. According to the Maine Comprehensive Outdoor Recreation Plan, there is a current need of day-use facilities to accommodate 750 persons, and this will rise to 1,200 persons in 1990. These figures are for the Pittsfield Day-Use Area which includes the whole Twentyfive Mile Stream Watershed. Day-Use facilities in the watershed today are less than current needs. The current facilities can accommodate about 50 persons. A public boat launch facility and a picnic area have been recently constructed on Sandy Stream.

Hunting opportunities are excellent for woodcock, ruffed grouse, white-tailed deer, snowshoe hare, fox, raccoon, and ducks. Hunting pressure for these species is light to moderate. There is moderate fishing pressure for warm water species by both residents and non-residents. Fishing for cold water species is located primarily in Sandy and Halfmoon Streams and their upstream tributaries.

Twentyfive Mile Stream is popular with a small number of canoeists. The classification of surface waters by the Maine Department of Environmental Protection indicates that even those waters in the watershed carrying the lowest classification, "C", are satisfactory for recreational boating and fishing, fish and wildlife habitat, and other uses except potable water supplies and water contact recreation.

Public access to Lake Winnecook is provided by the boat launch on Sandy Stream. Public access is also permitted to the state and federal game management areas in the watershed.

Archeological, Historical, and Unique Scenic Resources

Dr. David Sanger, Associate Professor of the Department of Anthropology of the University of Maine at Orono and a member of the Maine Historic Preservation Commission, made a study of the construction area to determine the possible presence of any archaeological resources. A field survey was made from the outlet of Lake Winnecook to a point two miles downstream on Twentyfive Mile Stream. The study includes a review of existing records and interviews with local "relic collectors." No archaeological values were discovered.

As of June 3, 1975, there were no known properties within the watershed listed in, or eligible for the National Register of Historic Places. The "Maine Historic Resources Inventory," published by the Maine Historic Preservation Commission in August 1974, lists the following historic building within the watershed:

"QUAKER MEETING HOUSE - Unity, Maine, (1827), Private

A serenely plain wooden meeting house which reflects in this architecture the beliefs of the Quakers who constructed it."

The meeting house will not be affected by the proposed project.

The area is not uniquely scenic.

Any values found in the future will be handled as stated in Public Law 86-523, National Reservoir Salvage Act; and Public Law 89-665, National Historic Preservation Act.

Soil, Water, and Plant Management Status

The overall trend in changed land use is nearly static. There has been a decrease in total cropland acreage from 43,000 to 31,000 acres from 1964 to 1969 in Waldo County.

The Waldo County Soil and Water Conservation District was organized in 1944. There are 469,760 acres in the district, with less than 10 percent in crops and pasture. The farming trend within the district has changed from general to intensive poultry and milk production. This trend has brought about a change from cropland to grassland. There are 163 District Cooperators in the watershed, and 115 conservation plans have been completed. About 57 percent of the land in the watershed is under cooperative agreement, and about 30 percent of planned conservation practices are applied. There are 74 Federal-State Forest Management Cooperators.

Modern resource conservation calls for the overall planning and treatment of units of land and water larger than the individual landholding. With this in mind, the modernized program of the district reflects the need for developing a broad approach to soil and water resource planning to augment the changing pattern of land use and ownership. Soil and water conservation on urban, wildlife, industrial, and recreational land is becoming increasingly critical. The district has placed a high priority on soil surveys to provide a sound basis for assistance to landowners, towns, and others in resource planning. The district also places a high priority on providing assistance to low-income farmers and to recreational development.

Projects of Other Agencies

The works of improvement included in this project will be an integral part of a coordinated development for the Kennebec River Basin. Work on the Twentyfive Mile Stream Watershed will have no adverse effect on any existing or proposed projects.

A public access area, boat ramp, picnic tables, and a parking area have been constructed on Sandy Stream by the Maine Bureau of Parks and Recreation.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land Treatment

A survey of land treatment problems in the watershed indicates that a total of 27,324 acres are in need of land treatment measures. Erosion, sedimentation, water management, low fertility, low crop yields, and animal and septic waste disposal are the major soil-related problems. Good cropland is at a premium and forms the basis of individual farming operations. Erosion on cropland averages 9 tons per acre per year over the life of the typical crop rotation. There is a direct correlation between the conditions of the cropland and the economic condition of the individual farm. Most farms are operated under a low level of management with inadequate land treatment. As a result, crop production is low. Land treatment, consisting of a good conservation crop system and a water management system, are necessary not only to perpetuate the agricultural productivity of the land, but to ensure the financial success of the individual family farm.

Sediment is a problem to communities in the watershed. Sediment is not a major threat to streams or reservoirs, but road ditches adjacent to cropland must be cleaned out frequently to maintain drainage capacity. This problem is reflected in flooded and icy roads and in increased taxes to support required public services.

A potential land use problem is the disposal of animal waste. There are approximately 73 poultry farms and 49 dairy farms in the watershed which produce approximately 94,100 tons of waste annually.

Currently, poultry waste is disposed of by piling on the land. Most poultry enterprises are located on just a few acres of land, contain very little cropland and are highly specialized. The soils on the small amount of cropland are usually inadequate for high annual rates of waste application, and a high percentage of the soils are poorly drained or shallow to bedrock. The dairy farms, for the most part, recycle their waste through crop production; however, many farmers still apply their waste to snow-covered ground and to areas adjacent to streams, and could create a water pollution problem.

The land treatment practices on the Twentyfive Mile Stream Watershed are designed to bring about desired changes in land use and productivity, and to perpetuate the agricultural base. A high percentage of the farm operations in the watershed fall into the low-income-producing category, and a large number fall into the poverty category. The average size of operating units and the current indebtedness of the operators create a major problem for farmers to carry out and install needed land use adjustments and treatments.

About 17,200 acres of forest land are in need of land treatment measures. Approximately 30 percent of the forest land is in below-average hydrologic condition due to former land use. More than three miles of

eroding skid trails and logging roads contribute high rates of sedimentation and runoff. Low forest land productivity is partially due to improper management.

Floodwater Damage

Twentyfive Mile Stream has experienced several damaging floods in recent years. Major floods occurred in 1954, 1966, 1969 and 1973. Nearly every spring some damage is caused by a combination of snowmelt and rainfall. Long duration storms during late summer or fall may also cause flooding damages. The intense rainfall of September 11, 1954, estimated at a 5-year frequency, caused floodwater damaged estimated to be \$66,500.

Three reaches were developed for evaluation, T-1, the area around the shores of Lake Winnecook and Prairie Road; T-2, the area from Prairie Road to the ledge restriction in the channel; and T-3, the area below the ledge restriction.

The principal floodwater damages in reach T-1 include damages to camps and cottages, recreational property, 69 acres of agricultural land, and road and bridge damage to Prairie Road; in reach T-2, 84 acres of agricultural land; and in reach T-3, 27 acres of agricultural land plus road and bridge damage to Route 139.

Cottages around Lake Winnecook are subject to flooding from storms of approximately a 5-year frequency and above. Other types of property damage that occur on almost an annual basis include shore frontage, boat docks, boats, lawns, motors, and pumps. Average annual damage to property and cottages has been estimated at \$50,950. Approximately 280 cottage owners on Lake Winnecook are affected directly by flooding which includes 157 with first floor damage and/or property damage and the remaining 123 are indirectly affected by such problems as loss of access or increased travel distances.

The 100-year storm inundates approximately 180 acres of agricultural land; average annual damages are estimated to be \$500. Damage to roads and bridges begins with a 2-year frequency storm and average annual damages are estimated to be \$12,100. Indirect damages attributed to the flooding are estimated to be \$10,100, and include loss of wages, traffic rerouting, loss of power, and loss of income by businesses and inhabitants of the watershed. The frequent flooding of roads creates a hazardous condition during summer and winter to residents and travelers in addition to the inconveniences of indirect travel required by flooded roads. Frequent flooding of wells and septic disposal systems creates a health hazard.

Erosion and Sediment Damage

Agricultural lands adjacent to the outlet of Lake Winnecook are frequently flooded and suffer scour and infertile overwash damage; however, these damages are generally limited to a small amount of land adjacent



Cottage adjacent to Lake Winnecook showing water damage. April 1966.



View of the same cottage as above with extensive ice and floodwater damage. Note ice cakes in foreground. December 1973.



Flooding on Route 139. The intersection to Prairie Road is opposite to the truck. April 1969.



Prairie Road heading north toward Burnham from Unity. The first bridge is in the background. The structural works of improvement will be north of this bridge. December 1973.



Flooding of campground adjacent to Lake Winnecook from spring runoff. April 1969.



Flooding of vacation homes adjacent to Lake Winnecook. April 1969.



Cottage adjacent to Lake Winnecook. Picture shows water entering front door. December 1973.



Agricultural land adjacent to Prairie Road the day after $5\frac{1}{2}$ " of rain. November 1966.



A cottage on the shore of Lake Winnecook several days after the water had started to recede. The line of ice on the cottage shows the depth of flooding. December 1973.



A view of a year-around home on the shores of Lake Winnecook. December 1973.

to the stream. The thickest observed accumulation of recent overwash measured one inch. Scouring has produced small gullies adjacent to the stream.

Agricultural lands, though a small percentage of the watershed, are seriously damaged by the loss of topsoil and the creation of small gullies in the fields. Sediment and erosion damages add to the owners' operating expenses thereby reducing their net income and, in some cases, produce a loss of usable land. Gross erosion over the entire watershed for a combination of land uses and types of erosion is one-to-two tons per acre per year.

Other sources of sediment and erosion are skid trails, logging roads, and dirt roads. These areas develop gullies and result in sediment deposited in the streams thereby lowering the water quality.

Streambanks are generally stable. Only minor areas of streambank erosion were noted. The urban areas and roadbanks probably produce the major portion of stream sediment. Average annual sediment yield at the mouth of the watershed is estimated to be 29,000 tons. This represents a sediment concentration of 140 milligrams per liter.

Drainage

About 650 acres of cropland, 350 acres of grassland, and 10,450 acres of forest land are affected by wet conditions. These areas are located on the Monarda, Scantic, Leicester, and Limerick soils. The major part of the wet cropland and grassland is located in the eastern and southeastern part of the watershed. The major part of the wet forestland is located in the western and northern parts of the watershed.

Wet conditions delay planting, can limit harvesting, and have a direct effect on the quality and quantity of the crop yield. The table on the following page presents average acreage yields for the various soils found in the watershed.

The 135-day growing season is inadequate to compensate for unusual delays; wet conditions are a critical negative factor in maximizing production. Forest lands likewise suffer limitations due to wet conditions which are reflected in quantity and quality.

Municipal and Industrial Water

The Town of Unity has no municipal water supply system. Private wells serve residences and businesses, and there is one small co-operative water supply system for a group of homes. The town is at a serious disadvantage as far as promoting community growth without having an adequate water supply. This condition exists for all of the communities in the watershed. Approximately 3,800 people live in the watershed and are served by ground water supplies. The wells are usually a low-yield

ESTIMATED AVERAGE ACREAGE YIELD OF VARIOUS CROPS
GROWN UNDER IMPROVED LEVEL OF MANAGEMENT 1/

CROP SOIL TYPE	Corn Silage (Tons)	Potatoes (Bu.)	Alfalfa (Tons)	Timothy (Tons)	Grass (Tons)	Pasture (Cow ac.Da.)	Apple (Bu.)
Excessively Well Drained							
Thorndike	16	450	4	3.5	3.5	200	--
Windsor	14	--	3	2.5	2	170	--
Well Drained							
Hartland	30	650	5	4.5	4.5	285	500
Moderately Well Drained							
Dixmont	25	500	4	3	3	230	400
Sutton	22	450	4	4	4	230	500
Deerfield	16	--	3.5	4	4	200	--
Belgrade	24	--	4.5	4	4.5	255	--
Poorly drained							
Monarda	14	--	--	3	3	170	--
Leicester	14	--	--	3.5	4	200	--
Scantic	14	--	--	3	3.5	--	--
Limerick	20	--	--	3.5	4	200	--

1/ Source: Maine Technical Guide, Soil Conservation Service

type but provide adequate supplies for domestic use. Areas for the development of high-yield wells do exist but have not been investigated and delineated. Developed supplies are not adequate for industrial growth beyond present levels.

Recreation

All waters in the watershed, except portions of Carlton Stream and Sandy Stream have been rated at least Class B-2. Carlton and Sandy Streams have been rated as Class C, and are suitable for all recreation except swimming. Recreational water quality problems arise from pollution from septic systems. Inadequate public access to land and water exists because of nearly complete ownership and development by private interests. Access is permitted at the discretion of individual land owners. The Sponsors will give consideration to providing additional public access to Lake Winnecook as the demand arises.

The present population within 25 miles of the watershed is 70,000 people. Population growth has been stagnant but is anticipated to increase at a low rate in the next decade. The influx of summer tourists and recreationists creates an added demand for recreation facilities.

There is no planned construction of public recreation facilities in the watershed. The Maine Comprehensive Outdoor Recreation Plan indicates a need for day-use facilities to accommodate 735 people. Present facilities in the watershed can accommodate about 50 persons.

Fish and Wildlife

According to the U. S. Fish and Wildlife Service and the Maine Department of Inland Fisheries and Game, fluctuating lake levels on Lake Winnecook have a detrimental effect on fish spawning and waterfowl nesting. The exposure of previously submerged spawning areas produces a kill on about 25 acres annually, although this may not be a significant factor to the populations of Lake Winnecook. Waterfowl habitat around the lake is also affected by the drying out of previously flooded wetland. The following table illustrates the area affected by various frequency events. This area is in addition to about 350 acres of normal wetland around the lake.

Frequency Event	Acres Flooded
2 year	460
10 year	480
20 year	500
50 year	620
100 year	650

Water Quality Problems

A monitoring program was begun on Lake Winnecook in 1973 by Unity College. The SCS established a surface water monitoring network on streams in the watershed in April 1974. Since June 1974 this network consists of twenty sampling stations, several of which are located below potential pollution problems. Each station will be sampled ten times yearly.

The following tables show the results of tests to date and the testing schedule that will be followed. The maps show the sampling locations.

LAKE WINNECOOK WATER QUALITY
BACTERIAL TESTS
1973

Collection Site	Lake Station	4/9	4/14	5/11	6/2	7/8	7/12
Open Water	1			0-0 ^{1/}		294-0	
Trailer Park	2			148-0		482-116	
Marina - brook	3			132-0	208-10	254-146	
Brook	4	490-24		1240-20	4-2	352-82	
Brook	5			412-12	236-180		
Brook	6			608-0			
Brook	7			948-40	176-68	114-12	
Brook	8	62-1		508-0	0-8		
Brook	9	20-0		420-136	136-4	362-24	
Brook	10	108-34		228-18		296-TMTC ^{2/}	
Brook	11	228-0				220-30	
Brook	12					488-274	
Brook	13			40-2	108-28	146-18	
Pipe	14			192-2	36-8	TMTC-122	
Brook	15		50-0		108-22	TMTC-TMTC	
Brook	16			216-0	108-24	TMTC-218	
Brook	17	40-0	32-11		192-146	TMTC-TMTC	
Brook	18				100-40	676-274	
Brook	19				60-6		
Brook	20				180-118		
Standing Water	21					TMTC-132	
Trestle	22						
Kanokolus Beach	23						
Sandy Stream	24					352-82	
Open water	25						
Open water	26						
Open water	27						50-6
Open water	28						
Open water	29						
Open water	30						432-0
Open water	31						
Open water	32						
Open water	33						50-6
Open water	34						
Open water	35						

^{1/} Total coliform - Total fecal--Most probable number per 100 milliliters of water.

^{2/} TMTC = Greater than 800

LAKE WINNECOOK WATER QUALITY
BACTERIAL TESTS
1973

CONTINUED FROM PREVIOUS PAGE

Lake Station	7/21	7/26	7/28	8/4	8/10	8/20	8/25
1					0-0		
2					216-34 ^{1/}		
3							
4	TMTC-136		TMTC-158		TMTC-TMTC ^{2/}		TMTC-TMTC
5	36-8				106-4		8-0
6	TMTC-TMTC		TMTC-44		TMTC-TMTC		TMTC-TMTC
7	78-4				TMTC-38		66-2
8	TMTC-140						146-20
9	54-14				TMTC-104		
10	154-16		230-170				108-30
11	114-24				TMTC-TMTC		88-26
12					TMTC-TMTC		
13	TMTC-TMTC		TMTC-260		TMTC-TMTC		
14	TMTC-TMTC		416-74		TMTC-146		114-16
15	0-16				TMTC-TMTC		
16	14-0						
17	220-40				TMTC-58		TMTC-TMTC
18	TMTC-TMTC		30-2		400-TMTC		42-170
19							
20							
21							
22					TMTC-184		
23					88-26		
24					TMTC-404		
25					TMTC-TMTC		
26		4-0					
27							
28		96-6					
29					40-4		
30							
31					TMTC-6		
32			16-2			18-6	
33							
34		80-2					
35				88-26			

^{1/} Total Coliform - Total fecal--Most probable number per 100 milliliters of water.

^{2/} TMTC = Greater than 800

Data supplied by C. Rabeni, Unity College.

TWENTYFIVE MILE STREAM WATERSHED

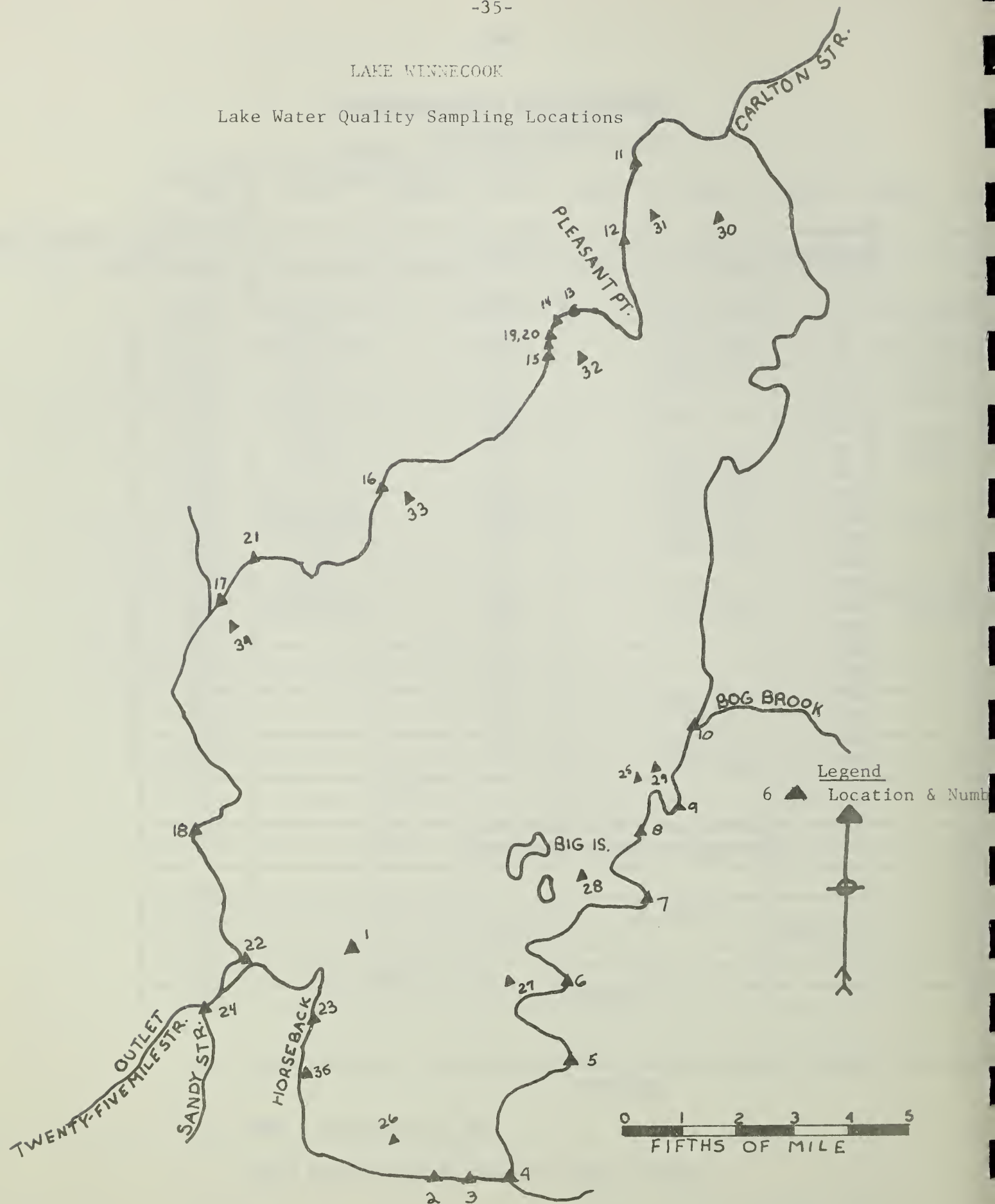
INITIAL STREAM BACTERIAL SAMPLES
1974

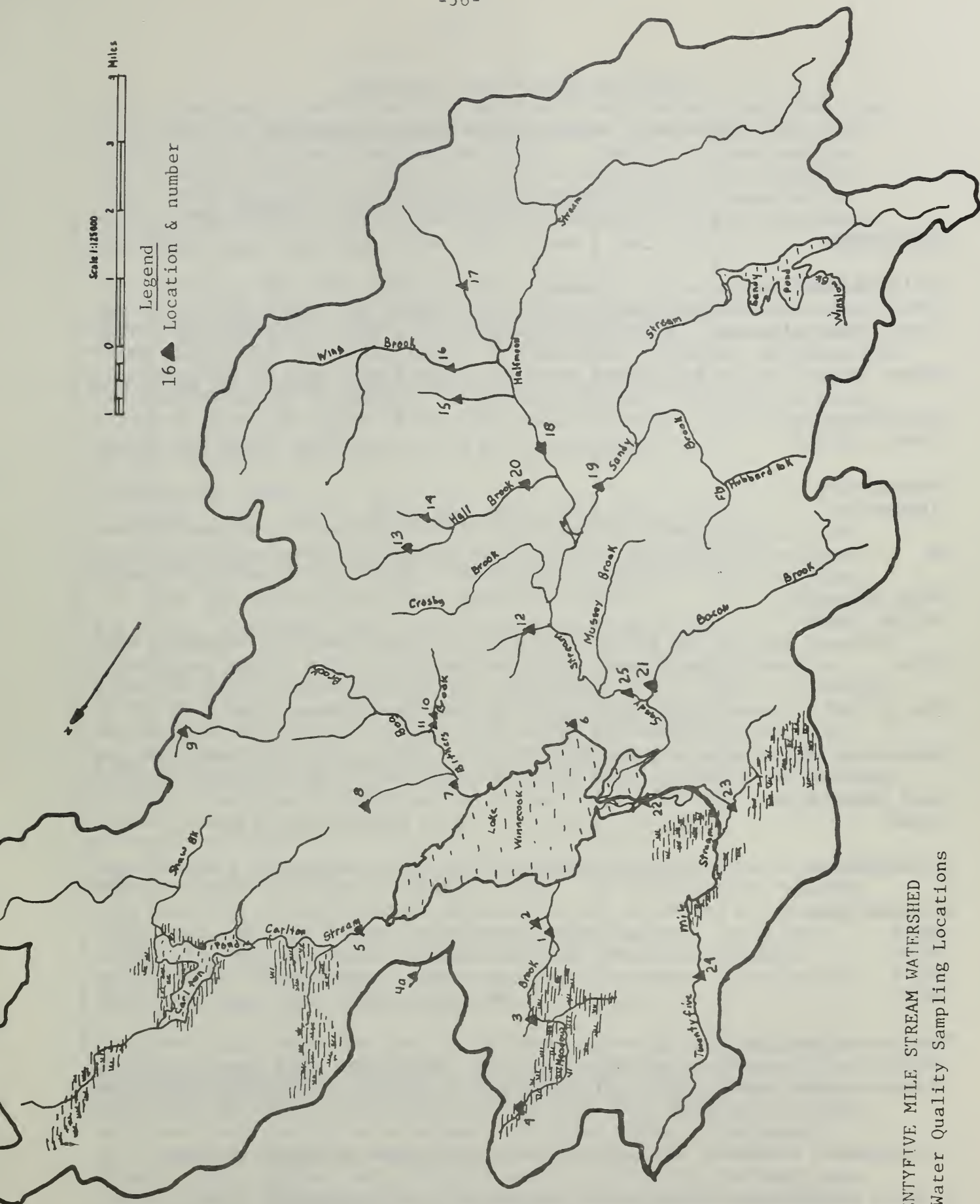
Stream Station	April 29 Total	May 6 Total Fecal	
1	320 <u>1/</u>	100	4
2	75	32	0
3	28	68	0
4	37	28	0
5	104	120	8
6	1480	428	2
7	436	180	0
8	97	172	0
9	62	244	0
10	45	468	0
11	9	248	0
12	63	160	3
13	42	11,900	89
14	114	156	4
15	54	160	0
16	27	80	1
17	43	100	0
18	77	156	3
19	78	232	0
20	64	96	0
21	49	116	0
4a	--	68	0

1/ Coliform per 100 milliliters.
(See map for sample locations)

LAKE WINNECOOK

Lake Water Quality Sampling Locations





TWENTYFIVE MILE STREAM WATERSHED
Stream Water Quality Sampling Locations

TWENTYFIVE MILE STREAM WATERSHED
AVERAGE 3/ WATER QUALITY VALUES BY MONTH

Measurement	1974						1975			
	Jun	Jul	Aug	Sep	Oct	Nov	Jan	Mar	Apr	May
Coliform bacteria										
Total (no. colonies)	1049	5034	365	503	55	30	18	572	7.4	115
Fecal (no. colonies)	79	160	97	200	10	1.5	3	27	0.6	98
Oxygen (ppm)	9.1	8.1	7.7	9.4	12.5	14.0	14.7	15	14.7	11.8
Turbidity (Set. solids)	--	0.86	0.91	1.10	---	---	---	2.5	---	---
Conductivity (umhos/cm)	77	73	93	86	86	96	86	74	64	80
pH	7.1	6.9	6.9	6.9	6.8	6.6	7.0	6.5	6.8	6.8
Total suspended Solids (ppm)	--	1.7	2.4	1.1	0.0	0.6	0.0	10.0	0.0	0.0
Color	--	---	37	---	---	---	---	---	---	---
Flow <u>1/</u>	X	X	X	X	X	X	X	X	X	X
Temperature (C)	21	19.8	20.1	15.8	5.2	0.2	0.4	2.3	4.6	16.2
Total Alkalinity (ppm)	20	17.9	20.5	24	24.8	24.6	22.0	18.8	16.1	25
Hardness (ppm)	24	20.3	22.9	21.9	23.1	21.8	21.6	16.5	15	22
Nitrates (ppm) <u>2/</u>										
NH ₃ -N	--	.04	.038	.020	.039	.017	.08	.08	.022	.032
NO ₃ -N	--	.97	.01	.01	.091	.15	{.40	{.59	{.21	
NO ₂ -N	--	.01	.26	.16	.01	.35				.24
TK-N	--	.62	.41	.28	.38	.53	.36	.41	.27	.36
Phosphates (ppm) <u>2/</u>										
Total P	--	.003	.028	.033	.02	.024	.025	.066	.019	.031
Organic carbon (ppm)	--	8.7	3.8	2.3	4.9	6.0	4.7	3.6	---	5.5

1/ Stages are recorded. Ratings will be accomplished in Winter 1975- 76.

2/ These samples were collected and delivered to the Department of Environmental Protection in Augusta, Maine.

3/ Average of all stations.

The surface water quality monitoring network will be modified after the first sampling year to represent key locations. This monitoring will continue into the post-construction period. Benthic studies are presently being conducted. These also will be continued after construction. Other pre- and post-construction studies will be conducted to evaluate the impacts on fish and wildlife resources as they are deemed necessary.

The results to date have revealed the streams in the watershed receive very little bacterial contamination. Only two stations revealed abnormally high bacterial counts. Lake Winnecook, however, has a degraded water quality due to the influence of lake shore cottages. The bacterial contamination is most severe along the shore during the summer months and lessens during the winter. Although classified "B-1" by the state, the water along the edges of the lake falls below the "B-1" standards during the summer months.

Economic and Social

Over 95 percent of the farms in the watershed are family farms. Low-income-producing units with gross sales of less than \$20,000 represent about 35 percent of the farms. Twenty-five percent of the farm units are below the poverty level net income of \$4,000.

This watershed is within the area designated as the New England Economic Development Region and is eligible for using redevelopment benefits under the Public Works and Economic Development Act of 1965. According to May 1975 data, unemployment was 10.0 percent in Waldo County. The national average was 8.3 percent. The number of farms in Waldo County has decreased from 942 in 1964 to 517 in 1969 and the reduction of cropland acreage from 43,000 acres to 31,000 acres reflects the decrease. Additional employment opportunities are needed to fill the void created by the closing of many farms.

Approximately 25 percent of the soils within the watershed have suitable characteristics for septic sewage disposal. It is estimated, however, that over half of the existing dwellings in the watershed are located on soils that have limitations for septic sewage disposal. Only one community in the watershed has public sewage services available. Consequently, ground and surface waters are threatened by poorly functioning on-site waste disposal systems.

In recent years there has been an increase of non-agricultural people building homes in the watershed. Very little of the development that has taken place has occurred on a planned basis. Most of the homes have been built on poorly suited soils for on-site waste disposal, and they have been developed in an unplanned, scattered manner. Unplanned development has contributed to high public service costs such as roads, schools, fire, police, and utilities and to location of residents near farming areas. Farm practices that result in air pollution and noise are considered intolerable by these new non-agricultural home builders. There is a definite need for planning carried out at all levels: individual, group, and unit of government.

ENVIRONMENTAL IMPACTS

Conservation Land Treatment

Land treatment measures will adequately treat 2,282 acres of cropland, 7,842 acres of grassland, and 17,200 acres of forestland, totaling 27,324 acres within the watershed. Average annual soil loss will be reduced to three tons from nine tons per acre on cropland, to one-quarter ton from one ton per year on grassland, and to one ton from three tons per acre on forestland. The average annual sediment yield at the mouth of the watershed will be reduced to 10,000 tons from 29,000 tons. Sediment concentrations will be reduced to an annual average of less than 100 mg/l.

Storm runoff will be retarded by an estimated two percent. Highway maintenance costs will be lessened by reducing sedimentation into drains and ditches. The hydrologic condition of forestland will be improved. Increased agricultural and forestland production and quality will result. Wildlife habitat management will be carried out on more than 500 acres.

Over 100 farm units and 80 non-farm units will receive assistance on land treatment measures through the project.

Structural Measures

Three evaluation reaches were used to describe changes in flood stages, discharges, and acres flooded.

Around Lake Winnecook (Reach T-1) the project will reduce 100-year level flood stages by 2.5 feet. The area flooded by the 100-year evaluation storm will be reduced from approximately 1000 acres to 600 acres, or a 400-acre reduction. Reach T-1 will receive 100-year level flood protection to agricultural land and 157 lake front cottages and property, and 50-year level flood protection to roads and bridges. Six lake front cottages will not receive 100-year level protection and will have a two to six percent yearly chance of receiving first floor damages.

From Prairie Road to the ledge restriction in the Twentyfive Mile Stream channel (Reach T-2), discharges will be reduced from 7,900 to 6,600 cubic feet per second, and flood stages will be reduced 5.2 feet for the 100-year evaluation storm. This reach will receive 100-year level protection to agricultural land. Route 139 will flood from storms having a recurrence interval greater than 100 years.

Below the ledge restriction to the mouth of the watershed (Reach T-3), discharges will be reduced from 8,100 to 6,800 cubic feet per second and stages will be reduced by 0.6 feet for the 100-year evaluation storm. This reach will receive 30-year level protection to roads and bridges and 5-year level protection to agricultural land.

The 1954 flood was rated as having a 5-year recurrence interval. The project will give all presently flooded areas at least a 5-year level of protection. Larger storms will flood some agricultural lands.

Channel design is presently in the preliminary stage. Considerable latitude exists for incorporation of features which will lessen the impact of the project on the environment.

Project action will directly affect about 3.3 miles of the Twentyfive Mile Stream channel, from the confluence of Twentyfive Mile and Sandy Streams to the downstream limit of construction. Overall, 2.6 miles of natural stream channel will be replaced or altered with a 1.8 mile reach of man-made channel.

Selective intermittent clearing and snagging will be done at seven locations affecting 1,500 feet of the 3,400 feet of channel between Lake Winnecook and Prairie Road. A reduction of cover and resting places for fish, waterfowl, and other wildlife will result from the removal of obstructions which reduce the flow characteristics of the channel.

Downstream from Prairie Road, 9,500 feet of a combination of new and enlarged channel will be constructed. About 5,900 feet of natural channel will be cut off and replaced with about 2,700 feet of new man-made channel. All cutoff meanders will be diked on the upstream side and blocked on the downstream side to retain about 10 acres of water, thus creating Type 5 wetland. The habitat in the cutoffs will be changed from a flowing water regime to one of shallow ponded water, resulting in a reduction of fisheries habitat. However, the cutoffs should provide very favorable habitat for furbearers, especially mink, muskrat, and beaver, and waterfowl, particularly black and wood ducks.

The channel bottom will be cut into rock at six locations along the channel. A one-foot layer of broken rocks will be left in the channel bottom as fish spawning and nursery area. It is expected that this area of about 35,000 square yards will serve to replace that lost to the fisheries resources of Twentyfive Mile Stream. Excess rock excavation will be used for rip-rap to prevent undercutting and ensure stable side slopes where the channel is cut through silt and sand. The gravelly pockets between the rock cuts will be excavated about two to four feet below grade to serve as pools for fish.

The appearance of the channel area will be changed from a slow-moving meandering stream with heavily vegetated banks, to one showing the effects of widening and straightening. As much as practicable the south side of the channel will be maintained in its natural state, with the large trees left for shade; spoil will be placed on the north side. The channel travelway, banks, and spoil disposal areas will be planted with wildlife foodbearing and cover-providing shrubs, legumes, and grasses. Leveled and seeded spoil piles will create openings through the existing vegetation which can be utilized by deer, grouse, hare, woodcock, and ducks. This will diversify the habitat and increase the carrying capacities for various game and non-game species.

During construction there will be a loss of fish and wildlife in the immediate area of the channel. Erosion and sedimentation will be accelerated during construction. Excavation of 2,700 feet of new channel will produce an estimated 100 tons of sediment. Widening and deepening of 6,800 feet of existing natural channel will produce an estimated 8,000 tons of sediment. Short-term sediment concentrations could reach 1,000 ppm. The channel construction will be performed in such a way as to keep downstream sedimentation to a minimum.

Currently, a biological study consisting of sampling the benthic invertebrate community is underway. Organisms such as mayflies, caddisflies, stoneflies, scuds, worms, snails, etc., have typical clean water assemblages and are very sensitive to water quality changes. These invertebrates will provide information on what, if any, disruption the construction caused, how fast the stream recovered, and if construction improved or hurt the stream habitat. This phase of the study will determine the baseline conditions by collecting bimonthly the organisms from above, within, and below the proposed construction area.

The following acreages of Type 7 wetland will be lost to: new channel excavation, 7.1 acres; widening of existing channel, 3 acres; and the Type C drop structure, 1 acre. The small areas committed to construction will have no effect upon the availability of any mineral resources.

Access along the stream for recreational use will be improved through the installation of a maintenance road. Recreational boating in the new channel will be restricted by the drop structures and shallower water. Boat launching will be permitted by the Town of Unity, if demand arises, from the drop structure maintenance road.

About 800 acres of wetlands of low value to nesting waterfowl^{1/} (Types 2, 5, 6, and 7) will be affected by the project. Four areas are involved as follows:

- 1) One hundred acres of hayland can be classified as Type 2 wetland without the project, which will eliminate periodic flooding on 75 acres of this land from anything less than the 100-year flood. There are less than 12,500 acres of Type 2 in Maine.
- 2) About 280 acres can be classified as a mixture of Types 6 and 7 wetland. Project measures will benefit the area by preventing the wide and frequent variations in water level now experienced. There are approximately 170,000 acres of Types 6 and 7 in Maine.
- 3) The same situation exists on 120 acres of Type 5 wetland located at the northern end of Lake Winnecook. Maine has less than 2,500 acres of this type.

^{1/} Manual for Maine's Wetlands Inventory, Me. Dept. Inland Fisheries and Game, Dec. 1972.

- 4) The project will prevent flooding of 300 acres of Type 7 wetland located downstream from Prairie Road from anything less than a five-year frequency flooded. There are about 150,000 acres of type 7 in Maine.

Ground water levels in this area will be lowered about one foot. Spruce and fir may invade the area, but basically the woodlands will not be altered.

A diverse terrestrial ecosystem will be encouraged in the woodland areas adjacent to and between Sandy Stream and Twentyfive Mile Stream as a result of reducing the frequency and duration of flooding. Flooding is a limiting factor in the establishment and growth of many terrestrial plants. More plants will be established and the area will be more productive because of improved site conditions. More plant, seed and fruit production and better growth will create a diverse and productive wildlife habitat.

The project will also affect 2,230 acre Lake Winnecook. Lake levels will continue to fluctuate but the range will be reduced to 4.8 feet from 7.3 feet.

The structural measures will provide flood protection to about 1,700 acres. Agricultural damages will be reduced by an estimated 90 percent and non-agricultural damages by 95 percent. The local sponsoring organization will publicize, at least once annually, the nature and extent of the hazards remaining in the areas subject to flooding by the 100-year event.

Land use in the flood plain includes agricultural land, lake-front cottages, roads and bridges, and forestland. The major crops are corn for silage and hay. Land use will not change on the agricultural land; however, approximately 40 acres of forest land around Lake Winnecook, currently available for wood production and wildlife habitat is expected to be lost by the future use of the area for cottage development. Sediment produced during cottage construction would enter Lake Winnecook. Erosion rates could increase to ten tons per acre per year from one-half ton. Conservation practices installed after development could return the rate to present levels. Unless closely regulated this development could be detrimental to the lake's water quality. This will reduce the amount of shoreline exposed to wave erosion during flooding. Submerged aquatic plants will grow more abundantly along the shoreline, providing more waterfowl feed and food and cover for fish.

As previously mentioned, the reduced water level fluctuation will also affect the wetlands at the northern and southern ends of the Lake. More stable water levels will provide better nesting conditions for waterfowl and provide better conditions for shoreline and marsh-spawning fish. Exposure of these areas in the past has led to destruction of eggs deposited during periods of spring high water.

Nonstructural Measures

The towns are responsible for the approval of all new development adjacent to Lake Winnecook and Twentyfive Mile Stream, as well as other classified bodies of water, in accordance with the mandatory Shoreland Zoning Law as adopted by the State of Maine Legislature. In addition, the towns will ensure that all developments are in accordance with the State of Maine Plumbing Code.

The results of the completed soil survey, in conjunction with a floodplain delineation map, will give the sponsors further information for use in regulating land use within the watershed and preventing development within the 100-year floodplain.

Economic and Social

Future development around the lake and the increase in property values resulting from a decrease in flooding would expand the tax base. Without project measures, only about 10 cottages could be developed on suitable sites. With the project measures land use changes which would create an estimated increase in land values of \$205,000 and tax base of one million dollars are anticipated.

Land treatment directly affects the economic base of the agricultural economy. An improvement in this base should result in financial gain to agricultural operators as well as increased employment. The effect will at least help maintain the population and maintain the aspect of a rural setting. Per capita income will rise as a result of project installation.

The land treatment measures and professional assistance by conservation technicians will lead to development of supplemental farm enterprises, such as recreation. The improved economy and the decrease of flood danger will lead to improvement in the quality of living for the people in the watershed.

Rural area development will be enhanced by a better managed agricultural base, reduced flood losses, improved land use planning, and improved recreational opportunities. The attractiveness of country living will be enhanced. Tourism and recreational traffic will increase. New business and additional development will increase the cost of town services to the area.

The project will serve as an example of sound conservation practices on agricultural land, proper land use planning in the developed areas, and how cooperation of communities and various levels of government can result in benefits from management of land and water resources.

An estimated 100 man-years of employment valued at one million dollars will result from installation of the project. Funds spent in the area will have a positive local economic effect.

The project will help protect the health and welfare of property owners by reducing the incidence and degree of well and spring contamination from flooded private sewage disposal systems. This will also improve the water quality and reduce eutrophication of Lake Winnecook by reducing the introduction of nutrients. The decrease in flooding will permit greater trafficability, access, and safety on roads presently inundated.

During installation of project measures traffic density, noise, road deterioration, and dust will be increased by construction vehicles.

Funds, energy, material, and labor spent on this project will not be available for use in other areas and on other projects.

There are no known historical, architectural, archaeological, or cultural values that will be affected by the project. The National Reservoir Salvage Act - Public Law 86-523, the National Historic Preservation Act - Public Law 89-665, and related acts will be adhered to.

FAVORABLE ENVIRONMENTAL EFFECTS

Assist over 100 farm units and 80 non-farm units in adequately treating 27,324 acres of land to:

- 1) Improve - hydrologic conditions; cover; water quality; wild-life management practices; quantity and quality of agricultural and forest products; agricultural income; and the standard of living and quality of life for low-income farmers and other watershed residents through more efficient and better use of resources
- 2) Decrease - soil loss, erosion, and sedimentation by about two thirds; highway maintenance costs arising from sedimentation; and runoff by about two percent

Reduce 100-year flood stages up to 5.2 feet and discharges by 1,300 cfs, and by lesser degrees during more frequent floods

Provide flood protection to 163 lake front cottages and homes, 1,700 feet of roads, one bridge, and 1,700 acres of land, thus reducing damages by 90 to 95 percent

Diversify, create, and/or mitigate for fish, waterfowl, and/or other wildlife habitat and increase carrying capacities by:

- 1) diking the cut-off meanders to retain a total of 10 acres of shallow ponded water, Type 5 wetland
- 2) planting and maintaining open areas such as the channel travelway, banks, and spoil disposal areas with foodbearing or cover-providing shrubs, legumes, and grasses
- 3) reducing areas and frequency of flooding
- 4) lowering the water table about one foot in the vicinity of channel excavation
- 5) leaving a one-foot layer of broken rock over a 35,000 square yard area of the channel
- 6) excavating fish pools and creating riffles
- 7) maintaining the south side of the channel in as near its natural state whenever possible, with large trees left for shade and spoil placed on the north side

Increase recreational access along the stream with the maintenance road and to the lake from the drop structure maintenance road

Reduce the amount of lake level fluctuation by 2.5 feet, therefore:

- 1) Reducing the amount of shoreline exposed to erosion during flooding
- 2) Providing better nesting conditions for waterfowl
- 3) Providing better conditions for shoreline and marsh-spawning fish
- 4) Preventing exposure of eggs deposited during spring high water
- 5) Reducing incidence and degree of well and spring contamination from flooded septic systems and introduction of nutrients to the lake, thus protecting health and welfare of property owners
- 6) allowing better submerged aquatic plant growth along the lake shoreline

Provide additional soils and floodplain information to aid in land-use regulation

Increase property values and the tax base

Increase recreation, tourism, and local business

Create 100 man-years of employment valued at one million dollars

Permit greater trafficability, access, and safety on roads once inundated

Publicize remaining flood hazards at least once annually

Restrict development in the 100-year floodplain through the work plan agreement, as well as through new non-project related environmental legislation

ADVERSE ENVIRONMENTAL EFFECTS

Reduce in area, change, and/or destroy existing types of fish, water-fowl, and/or other wildlife habitat by:

- 1) selectively clearing and snagging 1500 feet of existing channel
- 2) constructing 9,500 feet of a combination of new and enlarged channel
- 3) using 11.1 acres of Type 7 wetland for channel and drop structure construction
- 4) shortening the channel by 3,200 feet
- 5) reducing areas and frequency of flooding
- 6) lowering the water table about one foot in the vicinity of the channel excavation
- 7) possible loss of 40 acres to cottage development

Loss of some fish and wildlife during construction

Increase traffic density, road deterioration, and noise, air, and water pollution (turbidity from sediment) during construction, during new cottage development, and as a result of increased tourism and recreation

Alter the appearance of the natural channel

Restrict recreational boating due to the drop structures and shallower water

Increase aquatic vegetation along the lake shore

Increase costs of town services to the area

Commit funds, energy, material, and labor, precluding their use for other projects

ALTERNATIVES

Several alternatives were considered in the planning process to determine a system which would meet project objectives. The following are several of the nonstructural and structural systems which were considered:

Nonstructural

No Project - The No Project alternative would generate none of the adverse effects nor create any of the favorable effects of the planned project.

State and local laws and regulations would govern the development of the 10 cottage sites which are available on the lakefront. The 157 homes and properties, other rural homes, roads, and 180 acres of agricultural land will remain subject to flooding.

Annual average benefits foregone will amount to about \$40,000.

Land Treatment Only - This alternative is the same land treatment program which is proposed in the plan. All benefits and effects described for the land treatment phase of the proposed plan would result if this alternative were used.

Runoff from the watershed will be reduced by less than 2.5 percent. The level of protection provided to agricultural land is less than the 5-year frequency storm. Flood protection provided to lake shore homes and properties, rural homes, and recreational developments is less than the 100-year level desired.

The fish and wildlife habitat downstream from Lake Winnecook would not be disturbed. The habitat in and around the lake would continue to be subject to wide fluctuations of the lake level.

The estimated cost of this alternative is \$747,700.

Land Treatment, Relocation of Existing Cottages and Flood Plain Zoning - The land treatment is the same as the land treatment phase of the planned project. All benefits and effects will be produced from land treatment as previously described.

A flood hazard analysis would be performed to provide a more exact delineation of the flooded area. In order to avoid first-floor damages, about 87 cottages would be relocated, and sufficient peripheral land purchased and zoned to accommodate runoff from the design storm. The roads which are inundated would be raised to a flood-free elevation and the bridge on Prairie Road would be enlarged.

The raising of Prairie Road would deny its use for weir flow and higher lake stages would be created. Additional agricultural land would be inundated by the increased lake stages. Relocation of the cottages would require the commitment of other lands to development and additional land would be required for the installation of service facilities at the new location.

Borrow pits would be excavated to supply fill material for road improvements. Channel excavation would be required for the installation of new bridges. The development of about 10 additional cottage sites would be possible. Fishery and wildlife habitat would remain subject to widely fluctuating lake levels. Increased traffic between the construction sites would increase congestion, noise, and air pollution during the construction period.

The estimated cost of this alternative is about 3.25 million dollars.

Structural

Land Treatment and Floodwater Retarding Structures - A system which incorporated land treatment and eight floodwater retarding structures was evaluated, and other evaluations within this framework were made in which land treatment and various combinations of the eight floodwater retarding structures were used.

The land treatment in this alternative is the same as the land treatment phase of the planned project. All benefits and effects produced by the land treatment program in the planned project will result from the installation of land treatment in this alternative. Runoff will be reduced by less than 2.5 percent.

The installation of eight floodwater retarding structures would require the commitment of approximately 3650 acres to the purposes of sediment and floodwater storage, and to the dams and their appurtenances. Twenty-nine hundred and fifty acres of wetland habitat and 700 acres of upland game habitat would be committed to these purposes. Fishery habitat on 2,000 feet of stream would be destroyed by the installation of the dams, and no stream habitat would be inundated since all structures were considered to be dry structures. No warm water fisheries would be created by the impoundments. Upland game habitat of 40 acres would be created by the establishment of grass and shrubs on the dams, spillways, and borrow areas.

The impoundment of runoff by the structures would have very little effect on the level of flooding around Lake Winnecook due to the poor discharge efficiency of the outlet channel from the lake.

The estimated cost of this alternative is in excess of 2.5 million dollars.

Land Treatment, Floodway and Channel Excavation - The land treatment would be the same as in the proposed plan, and all benefits and effects would be the same.

A floodway would be constructed parallel to Highway 139 to connect Sandy Stream with Twentyfive Mile Stream. The channel of Twentyfive Mile Stream would be excavated a distance of 1,600 feet to improve the discharge efficiency.

This alternative would permit flood flows to bypass the damage area around Lake Winnecook and be discharged into the Twentyfive Mile Stream channel west of Highway 139.

The floodway would require 15 acres of land which would be established in vegetation and shrubs adapted to the site. Stream habitat on 1600 feet of Twentyfive Mile Stream would be modified. Wildlife habitat along the channel would be improved by diversifying the habitat from wooded to the open areas along the channel where the spoil is spread.

Topography along the route of the proposed floodway will require the use of numerous reinforced concrete grade control structures to establish a stable grade. Annual operations and maintenance costs will be high.

The estimated cost of this alternative is in excess of 2 million dollars.

Land Treatment and Floodway Adjacent to Twentyfive Mile Stream

The land treatment portion of this alternative would be the same as in the proposed plan and would result in the same benefits and effects attributable to land treatment.

A floodway completely separate from the channel would be constructed on the north side of Twentyfive Mile Stream from Lake Winnecook to a point downstream of the proposed channel work area. The dimensions of the floodway would be essentially the same as those of the channel proposed in the plan. Ledge excavation would also be required. Excavation quantities would be greater by about 25 percent. Additional land easements would be necessary. Thirty acres of farm and woodland would be committed to the floodway.

Alteration of the existing channel would be required at both the upstream and downstream ends of the floodway, with extensive alteration at the upstream end. The present bridge would remain and an additional bridge box inlet structure would be constructed north of the present bridge. A type "C" drop structure would be constructed on the floodway and would be connected to the Lake Winnecook outlet and the natural channel by a by-pass channel. Provisions would be made to discharge the baseflow through the natural channel and divert the flood flows through the floodway. Vector control would be a problem. Operation and maintenance costs would be greater since continuous flows would not be maintained in the floodway. Installation costs would be about 25 percent greater.

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE
MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

An analysis of present and future land use done in conjunction with this project has indicated that there will be very little change during the evaluation period of the project. The net change is expected to be about 50 acres of forest land into development of various types. The significance of this change appears small when compared to the 73,344 acres of forest land in the watershed. The only formal land-use plans are conservation plans on privately owned land units.

The objectives of this project are not considered to be short-term. During the attainment of these objectives, there will be some short-term effects. Disturbance of land and wildlife, increased noise and traffic, and increased erosion will occur during construction. Most of these effects will be eliminated within a year after completion of construction. The increased erosion will not totally diminish until the new channel has stabilized and vegetation has been established. The utilization of land for the channelway is not considered to be a short-term use.

Projected long-term future uses of most of the land will not be adversely affected by project measures. Projected future use on 800 acres by wildlife requiring frequently flooded land will be changed. This land will flood only for storms with frequencies in excess of five years. The area will be usable by wildlife; however, there will be a change in type.

Land treatment measures do involve short-term uses of resources; however, these measures are designed to permit long-term use of the soil and water resources with the least possible amount of detrimental effect. The treatment measures do not require an irreversible commitment of land resources. The effect of land treatment on erosion and sedimentation will be long-term. As the program progresses, their effect will be gradually decreased to a level lower than present conditions. The accumulation of sediment due to slightly increased sediment trap efficiency on Lake Winnecook should be offset by the reduced amount of sediment carried by the streams. The more rapid discharge flood flows should also decrease normal lake sedimentation and that enhanced by the grade control structure.

The project should continue to operate effectively beyond its design life if maintenance is performed. Sediment storage is not planned as a function of any of the flood control structures. Small ponds as part of land treatment will trap sediment and eventually will require cleanout to maintain their efficiency. Other land treatment measures should continue to function as long as they are maintained.

There are no other PL-566 watershed projects in the St. Croix Water Resources Region as designated by the Water Resources Council. Water resource projects in the Kennebec River Basin and the St. Croix Water

Resources Region were considered in their relationship to the Twentyfive Mile Stream Watershed Project. This project, primarily one of land treatment and channel improvement, has no similar relationship to other water resource projects in the region. Other projects are primarily water impoundments for fish and wildlife, recreation, logging, and power development. Cumulative effects do not accrue due to the dissimilarity of these projects.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Approximately 11.1 acres of Type 7 wetland will be utilized for construction and spoil disposal. Future developments of cottages around Lake Winnecook may use about 40 acres of forest land. The present vegetative cover on these lands would be destroyed. The use of these areas for wood production would be precluded. The cutoff meanders will change from free-flowing channels to either channel remnants with ponded water or water courses carrying local drainage. About 30 acres of land will be utilized as impoundment sites for farm and wildlife ponds as part of the land treatment program. The funds, energy, labor and materials used for this project will preclude their use elsewhere and will be irreversibly and irretrievably committed.

CONSULTATION WITH APPROPRIATE FEDERAL AGENCIES AND REVIEW BY STATE AND LOCAL AGENCIES DEVELOPING AND ENFORCING ENVIRONMENTAL STANDARDS

General

The local sponsors, fish and wildlife interests, landowners, and conservation interests were involved in the process of developing this project. The following tabulation chronicles the coordination with and input of various groups.

March 1964	Sponsors organized and submitted their application for a watershed project.
April 1964	State Soil Conservation Commission approved application.
June 1964	State Soil Conservation Commission requested a field review.
October 5, 1964	Public information meeting held in Unity.
October 12, 1964	Meeting held with Maine Department of Inland Fisheries and Game, U. S. Fish and Wildlife Service and sponsors.
October 13, 1964	Field review completed and distributed to interested parties.
October 28, 1964	State Soil Conservation Commission approved the field review and requested Preliminary Investigation.
November 2, 1964	Application sent to SCS Administrator.

November 9, 1964	U. S. Army Corps of Engineers notified.
August 20, 1965	Preliminary Investigation (P.I.) completed and distributed.
August 23, 1965	Sponsors met to discuss the findings of the Preliminary Investigation.
October 6, 1965	State Soil Conservation Commission approved the P.I. and submitted its recommendations to SCS Administrator.
October 18, 1965	Application approved by the SCS Administrator.
October 1965	Sponsors and SCS requested participation and/or comments from the following agencies, organizations and persons in the work plan development:
	SCS, Technical Service Center, Upper Darby, Pa.
	SCS Engineering and Watershed Planning Unit, Upper Darby, Pa.
	SCS Regional Biologist, TSC, Upper Darby, Pa.
	SCS Regional Agronomist, TSC, Upper Darby, Pa.
	SCS Regional Woodland Conservationist, TSC, Upper Darby, Pa.
	SCS Regional Resource Development Specialist, TSC, Upper Darby, Pa.
	Asst. Regional Forester, U. S. Forest Service - Eastern Region, 6816 Market St., Upper Darby, Pa.
	Regional Director, U. S. Dept. of Health, Education and Welfare, 120 Boylston St., Boston, Mass.
	Area Director, Area I, Mineral Resource Office, Bureau of Mines, U. S. Dept. of the Interior, 4800 Forbes St., Pittsburg, Pa.
	Deputy Division Engineer, U. S. Army Corps of Engineers, 424 Trapelo Road, Waltham, Mass.
	Regional Supervisor, Branch of River Basin Studies, U. S. Fish and Wildlife Service, 59 Temple Place, Boston, Mass.
	Supervisor, Concord Area Office, U. S. Fish and Wildlife Service, 3 Pleasant St., Concord, N.H.
	Regional Director, Bureau of Outdoor Recreation, U. S. Department of the Interior, U. S. Court House, 9th and Chestnut St., Philadelphia, Pa.

Regional Director, Bureau of Sport Fisheries and Wildlife, 59 Temple Place, Boston, Mass.

Regional Biologist, SCS, Federal Bldg., Durham, N.H.

Regional Conservation Agronomist, SCS, 29 Cottage St., Amherst, Mass.

State Director, Agricultural Stabilization and Conservation Service, USDA Office Bldg., University of Maine, Orono, Maine

Agricultural Research Service, University of Maine, Orono, Maine

District Engineer, Water Resources Division, U. S. Geological Survey, Vickery-Hill Bldg., Court Street, Augusta, Maine

State Director, Farmers Home Administration, USDA Office Bldg., Orono, Maine

Chairman, Maine Soil Conservation Commission, Augusta, Maine

Executive Secretary, Maine Soil Conservation Commission, Augusta, Maine

Dean, College of Agriculture, University of Maine, Orono, Maine

Commissioner, Maine Forest Service, State House, Augusta, Maine

Atwood and Blackwell, 5 Boylston Place, Boston, Mass.

Penobscot Development Company

Great Northern Paper Co., 6 State Street, Bangor, Maine

James Sewall Company, 147 Center Street, Old Town, Maine

Commissioner, Maine Public Utilities Commission, State House, Augusta, Maine

Commissioner, Maine Department of Economic Development, State House, Augusta, Maine

Associate Director, Cooperative Extension Service,
University of Maine, Orono, Maine

Director, Agricultural Experiment Station, Uni-
versity of Maine, Orono, Maine

Director, Division of Sanitary Engineering, Dept. of
Health and Welfare, Augusta, Maine

Commissioner, Maine Health and Welfare Dept., State
House, Augusta, Maine

Commissioner, Maine Dept. of Inland Fisheries and
Game, State House, Augusta, Maine

Dept. of Inland Fisheries and Game, University of
Maine, Orono, Maine

Chairman, Maine State Highway Commission, State
House, Augusta, Maine

Engineer of Federal Aid and State Highways, State
Highway Dept., Augusta, Maine

Division Engineer, State Highway Dept., Box 1940,
Portland, Maine

Director of State Parks, State Park and Recreation
Commission, State House, Augusta, Maine

Commissioner, Maine Sea & Shore Fisheries, Augusta,
Maine

School of Forestry, University of Maine, Orono,
Maine

The Maine Townsman, Executive Secretary of Maine
Municipal Assn., 89 Water Street, Hallowell, Maine

Master of State Grange, West Minot, Maine

Executive Secretary, Maine Farm Bureau, Water
Street, Augusta, Maine

Comments were received from the following agencies:

Maine Dept. of Sea and Shore Fisheries

U. S. Dept. of the Interior, Bureau of Mines

Atwood and Blackwell Co.

U. S. Dept. of Health, Education and Welfare

U. S. Dept. of Agriculture, Maine Agricultural Stabilization and Conservation Service

U. S. Dept. of the Interior, Bureau of Sport Fisheries and Wildlife

U. S. Dept. of Agriculture, SCS Regional Biologist

Maine Dept. of Inland Fisheries and Game

U. S. Dept. of Agriculture, Forest Service

February 23, 1966 SCS met with Maine Dept. of Inland Fisheries and Game.

February 27, 1967 Sponsors' meeting; Maine Inland Fisheries and Game, State Senator and Representatives, sponsors and SCS in attendance.

September 30, 1968 Sponsors' meeting; Unity Selectmen, SCS, local fish and game club in attendance.

October 29, 1968 Sponsors' meeting; selectmen, Maine Parks and Recreation, S&WCD, and SCS in attendance.

February 19, 1969 Sponsors' meeting; Maine Inland Fisheries and Game, SCS, S&WCD, and selectmen.

March 14, 1970 Project discussed at the Unity Town Meeting.

November 5, 1970 Sponsors' meeting; Maine State Highway Commission, Maine Inland Fisheries and Game, selectmen, S&WCD, and SCS in attendance.

January 1971 First draft of work plan completed and distributed to the following agencies and people for comment:

U. S. Dept. of Agriculture, Forest Service
U. S. Dept. of the Interior, Fish and Wildlife Service
Maine Dept. of Inland Fisheries and Game
Maine State Highway Commission
Sponsors

Comments were received on the first draft of the work plan from the following agencies:

U.S.D.A., Forest Service
Maine Department of Transportation
U.S.D.I., Fish & Wildlife Service
U.S.D.A., SCS, Technical Service Center

March 9, 1971	Project discussed by SCS with Waldo County Commissioners, and Commissioners endorsed project.
May 21, 1971	National Park Service, Maine Historical Society, and Dept. of Anthropology, University of Maine were requested to assist in locating and evaluating places of historical or archeological value in the watershed.
August 1971	SCS met with selectmen of Burnham, Unity, and Troy.
August 30, 1971	Public meeting in Unity
December 13, 1971	Open meeting - Unity officials met with SCS to review landrights procedures.
April 24, 1972	SCS met with selectmen of Burnham to discuss landrights.
August 29, 1972	SCS met with sponsors to discuss landrights.
September 7, 1972	SCS met with Burnham officials and landowner to discuss easements.
October 19, 1972	Informational meeting open to the general public in the project area.
December 12, 1972	SCS and Maine Inland Fisheries and Game review the project in the field.
October 10, 1973	U. S. Dept. of the Interior, Fish and Wildlife Service submitted their Post Authorization Report for the watershed.

During formulation of the plan, press coverage was provided to inform the general public.

During the Spring of 1974, Mr. Charles Rabeni, Aquatic Biologist, of Unity College was contracted to conduct a water quality monitoring program in the watershed and a preconstruction investigation of the benthic invertebrate community in Twentyfive Mile Stream. Both of these studies are ongoing with the first reports due in winter 1975. Water Quality data to date is presented on Pages 31-38.

November 14, 1974	Informal field review was held.
December 16, 1974	A tour of the watershed was conducted. The following people were sent copies of the draft Watershed Work Plan and Environmental Impact Statement and invited to attend the field trip: (Asterisk indicates people who did attend or sent representatives.)

Mr. Wendall Trembly
Executive Director
Maine Fish and Game Assoc.

Mr. Sterling Dow III
Executive Director
Maine Assoc. of Conservation Com.

Mr. Richard Anderson
Executive Director
Maine Audubon Society

*Mr. Clifford Goodall
Executive Director
Natural Resources Council

Mr. Jeffrey Carlin, President
Trout Unlimited, Sunkhaze Chapter

Mr. John Cole, Editor
Maine Times

*Mr. Marshal Stone, Editor
Bangor Daily News

Mr. Steve Curtis, Editor
Republican Journal

*Dr. William H. Gilbert, President
State Biologists Association
Colby College

*Mr. Dana Stephenson
First Selectman
Unity, Maine

*Mr. Kenneth Murch
County Commissioner
Unity, Maine

Mr. Phillip Patten
First Selectman
Troy, Maine

Mr. Ralph Huff
First Selectman
Burnham, Maine

Ms. Patricia Stimetz
Executive Secretary
Congress of Lakes Association

*Mr. Harry Friedman, Chairman
Waldo County Soil & Water
Conservation District

*Mr. Charles Ritze, Biologist
Maine Department of Inland
Fisheries and Game

*Mr. Richard L. Duesterhaus
State Conservationist
Soil Conservation Service

*Mr. Lauren H. Long
State Resource Conservationist
Soil Conservation Service

*Mr. Arthur Dearborn III
Watershed Planning Staff
Leader, Soil Conservation
Service

*Mr. Richard Davidson
District Conservationist
(Belfast)
Soil Conservation Service

*Mr. Charles Boothby
Executive Director
Maine Soil & Water Conservation
Commission

ADDITIONAL PEOPLE IN ATTENDANCE

Mr. Gerald Fowler
Supervisor
Waldo County Soil & Water
Conservation District

Mr. Norman Soderberg
Bangor Daily News
Unity Correspondent

ADDITIONAL PEOPLE IN ATTENDANCE

Dr. Jan F. Sassaman
Unity Planning Board
State Biologists Assn. Board Member
Unity College

Dr. J. Mudge
State Biologists Association
University of Maine
Farmington, Maine

Mr. Gary Donavan, Biologist
Maine Department of Inland
Fisheries & Game

Discussion and disposition of each comment on draft Environmental Impact Statement

Comments on the draft Environmental Impact Statement were requested from the following organizations:

Advisory Council On Historic Preservation
Federal Power Commission
U. S. Department of Agriculture, Office of Equal Opportunity
U. S. Department of the Army, Corps of Engineers
U. S. Department of Commerce
U. S. Department of Health, Education and Welfare
U. S. Department of the Interior
U. S. Department of Transportation
U. S. Environmental Protection Agency
Governor of Maine
Maine Department of Conservation, Bureau of Forestry
Maine Department of Conservation, Bureau of Parks and Recreation
Maine Department of Environmental Protection
Maine Department of Inland Fisheries and Game
Maine Department of Marine Resources
Maine Soil and Water Conservation Commission
Maine State Historic Preservation Officer
Maine State Planning Office
Maine Wetlands Control Board
Maine Association of Conservation Commissions
Maine Audubon Society
Maine Congress of Lakes Association
Maine Fish and Game Association
Maine Historical Society
Maine Natural Resources Council
North Kennebec Regional Planning Commission
State Biologists' Association
Trout Unlimited, Sunkhaze Chapter

Comments were received from the following organizations:

Advisory Council On Historic Preservation
Federal Power Commission
U. S. Department of Agriculture, Agricultural Research
Service, N. E. Plant, Soil, and Water Laboratory
U. S. Department of Agriculture, Farmers Home Administration
U. S. Department of the Army, Office of the Assistant Secretary
U. S. Department of Health, Education, and Welfare
U. S. Department of the Interior, Bureau of Outdoor Recreation
U. S. Department of the Interior, Geological Survey, Water Resources
Division
U. S. Department of the Interior, Office of the Secretary
U. S. Department of Transportation, U. S. Coast Guard

U. S. Environmental Protection Agency
Governor of Maine
Maine Department of Conservation, Bureau of Parks and Recreation
Maine Department of Environmental Protection, Commissioner
Maine Department of Environmental Protection, Bureau of Land Quality
Control, Director
Maine Department of Environmental Protection, Bureau of Land Quality
Control, Enforcement Division
Maine Department of Inland Fisheries and Game
Maine Department of Health and Welfare
Maine Department of Transportation, Bureau of Planning
Maine State Historic Preservation Officer
Kennebec Valley Conservation Association
North Kennebec Regional Planning Commission
State Biologists' Association

Comments and replys to comments follow:

General

The SCS and the sponsors express appreciation to all the parties that responded to the request for comments on the draft EIS.

Advisory Council On Historic Preservation

- 1) Comment: The draft EIS is inadequate regarding project effects on National Register property.

Reply: Concur. The discussion has been rewritten and expanded to better define the study and project effects. (see p. 19)
- 2) Comment: A copy of the State Historic Preservation Officer's comments should be included in the final EIS.

Reply: The SHPO's comments are included in the final EIS. (see p. C-41)

Federal Power Commission

- 1) Comment: No unfavorable comment.

Reply: We thank the FPC for reviewing the documents as requested.

United States Department of Agriculture, Agricultural Research Service,
N. E. Plant, Soil, and Water Laboratory

- 1) Comment: The summary sheet does not address impacts.

Reply: Concur. The section has been rewritten to reflect the listing of favorable and adverse effects found in the main part of the EIS. (see pp. i and ii)
- 2) Comment: Moving the definition of "land treatment" nearer the start of the EIS would help.

Reply: Concur. The definition was moved as suggested. (see p. 2)

USDA, Farmers Home Administration

- 1) Comment: Support the project and offer assistance to SCS and the sponsors.

Reply: We thank the FmHA for its concurrence and willingness to help.

U. S. Department of the Army, Office of the Assistant Secretary

- 1) Comment: The EIS is adequate and the project does not conflict with any Department program.

Reply: We thank the Department for its review.

U. S. Department of Health, Education, and Welfare

- 1) Comment: The EIS adequately addresses impacts within HEW's responsibilities.

Reply: We thank HEW for its review.

U. S. Department of the Interior, Bureau of Outdoor Recreation

- 1) Comment: Unable to comment because of budget and manpower limitations.

Reply: We regret that BOR was unable to give an in-depth review.

U. S. Department of the Interior, Geological Survey, Water Resources Division

- 1) Comment: Found no technical difficulties in the EIS.

Reply: We thank the USGS, WRD for its review.

U. S. Department of the Interior, Office of the Secretary

- 1) Comment: Include evidence of contact with the State Historic Preservation Officer and a copy of his comments in the final EIS.

Reply: The State Historic Preservation Officer's comments are included in the final EIS. (see p. C-41)

- 2) Comment: Discuss the project's effect on the availability of mineral resources.

Reply: The discussion has been expanded to show no restriction as to availability of mineral resources. (see p. 41)

- 3) Comment: Discuss the "beneficial" effects of "drying out" previously flooded wetlands.

Reply: The draft EIS, pages 27 and 32, under "Environmental Impacts" discussed some of these effects. Discussion has been expanded to include some others. (see p. 42)

- 4) Comment: Delete "Wildlife access will be improved along the new channel".

Reply: Concur.

- 5) Comment: Include loss of furbearer habitat due to oxbow cutoff.
- Reply: Retention of shallow, ponded water in 3,000 feet of the cutoff oxbows will provide wetland habitat (Types 3,4,5, and 6) of high value to furbearers, especially mink, muskrat, and beaver. This discussion has been expanded in the final EIS. (see p. 40)
- 6) Comment: State that construction will totally destroy existing habitat.
- Reply: Discussion was expanded to reflect the destruction of existing habitat in construction areas and the replacement with a different type of habitat. (see pp. 40-42)
- 7) Comment: Refer to value for waterfowl only when discussing "low-value" wetlands.
- Reply: Concur. Values are for "nesting waterfowl" as given by the Maine Department of Inland Fisheries and Game. The value of these lands for other wildlife varies greatly.
- 8) Comment: Include various aspects of fish and wildlife populations in the biological monitoring program.
- Reply: Concur. Preliminary steps for such a study are underway.
- 9) Comment: Reference should be made to Maine's recent land use and private sewage disposal system regulations.
- Reply: The Mandatory Shoreland Zoning Act and State Plumbing Code were mentioned. However, the discussion has been strengthened to emphasize the individual town's responsibility for enforcement and leadership. (see p. 43)
- 10) Comment: Mention removal of fish cover as well as wildlife cover.
- Reply: Concur. Discussion was added to the final EIS (see pp. 40-43) to refer to loss of fish cover. However, the draft EIS referred to several mitigation measures designed to replace the cover lost during construction.
- 11) Comment: Delete the "maintenance of backwater" in the cutoffs as an adverse effect.
- Reply: Concur. Discussion was expanded to reflect the beneficial effects of maintaining backwater. (see p. 40)
- 12) Comment: Delete reference to wetlands as "low-value".
- Reply: Concur. See comment 7 above.

13) Comment: Show loss of habitat associated with 7.1 acres of Type 7 wetland.

Reply: Concur. Replacement with a different type habitat is mentioned. (see p. 42)

14) Comment: Show why lowering the water table is an adverse effect.

Reply: Discussion has been expanded to show both adverse and beneficial effects of a lowered water table. (see p. 42)

U. S. Department of Transportation, U. S. Coast Guard

1) Comment: No comments and no objections.

Reply: We thank the USCG for its review and support.

U. S. Environmental Protection Agency

1) Comment: What effect will the relocation of the stream channel have upon the flow rate and volume of the stream?

Reply: Present and with-project discharges were discussed on page 5 and tabulated on page 6 of the draft EIS. Peak discharges will be less for all storms greater than the one-year frequency storm (see final EIS p. 8). Design velocities appear in Table 3A of the work plan.

2) Comment: How will effluent from the Unity secondary treatment plant be affected?

Reply: The plant was designed for 2,500 people or an inflow capacity of 250,000 gal/day. This equals an average discharge of 0.39 cfs. Present loading is between 20,000 to 30,000 gal/day for an average discharge of 0.039 cfs. When Unity College closes for the summer, this decreases further.

Two lagoons cover an area of 25 acres, have an operating depth of five feet, and have 3:1 side slopes. The bottom is gravel and cobbles. Detention time is 260 days and there is complete separation between storm and septic waste.

The chlorination station is about 1,000 feet from the stream. At the present discharge rate, no chlorine residue was found at the outfall with normal chlorine treatment. The sewer district stores effluent in the two lagoons for three or four months, then chlorinates it and releases it into the stream at a rate of about 0.5 cfs.

The outfall is located at a section of Twentyfive Mile Stream which will not be relocated. However, the bed will be lowered from an elevation of about 165 feet msl to 162.6 feet msl. The bottom of the footing on the outflow headwall is 167.56 feet msl. The invert of the small outflow pipe, which was designed to always be submerged, is 169.80 feet msl, and that of the large outflow pipe is 170.69 feet msl. Normal water surface is at about 170 feet msl.

Either the headwall and pipe section to the first manhole will have to be rebuilt or the pipes extended to the pilot channel to ensure constant submergence of the outfall.

The total volume of water passing through the stream will be essentially the same upon completion of the project as before. The velocity of the stream during passage of the 100-year flood will be increased by 1.73 fps to 3.22 fps. The increased velocities will improve the mixing of the effluent with the stream water and result in an improvement in water quality.

The effects of construction will limit the physical and biological diversity of the stream and, therefore, its assimilative capacity, until such time as the stream characteristics are restored to a more natural state.

It is not expected that the project action will be detrimental to the long-term water quality of Twentyfive Mile Stream.

- 3) Comment: "The floodplain encroachment which has already occurred has initiated a pollution problem from the runoff of the septic system leaching fields into the lake."

Reply: This is a condition which, as noted, already exists and is not project related. However, the project will reduce the effects of this problem in the future.

- 4) Comment: "If future development is to be encouraged to settle in the floodplain due to this project, federal water quality standards may again be violated due to the unsuitability of soils for septic tank disposal."

Reply: It is not the intent of this project to encourage future development in the flood-prone area. On the contrary, the draft EIS (page 29) states that the sponsors will prevent development in the flood-prone area; also, item 11 of the Watershed Work Plan Agreement will prevent development below elevation 180 feet msl. The recent

Maine State Plumbing Code, Mandatory Shoreland Zoning Act, and the Site Location Law combine to give the State and its municipalities the power to control undesirable development. All future development must comply with this legislation. It should be noted that there are many reasonably environmentally safe, approved methods of private sewage disposal which do not require septic tank and leach field systems. A good deal of future development could occur if such systems are used.

- 5) Comment: Shoreland Zoning has not yet been voted upon by the towns involved (March 20, 1975).

Reply: The Town of Unity passed a shoreland zoning ordinance on March 15, 1975. The Towns of Troy and Burnham had not passed such ordinances as of May 7, 1975, although this is possibly a topic for a later town meeting.

- 6) Comment: Future impact of the project in terms of secondary effects has not been adequately explained.

Reply: The revision of the "Environmental Impacts" section of the EIS and the replies to specific comments made by reviewing agencies explain these effects in more detail.

Governor of Maine

- 1) Comment: Acknowledged receipt. Comments will be delayed.

Reply: We regret that the Governor has not yet reviewed the EIS.

Maine Department of Conservation, Bureau of Parks and Recreation

- 1) Comment: Note that the public recreation objective was removed from the last draft of the EIS.

Reply: Correct. All benefits related to public recreation were removed since recreation is not a project objective.

- 2) Comment: Question three "Favorable Environmental Effects."

(a) Comment: "Increased tax base and local business because of increased recreation" - if areas become year-round recreational areas the cost of new services often exceeds tax revenues, but this is not the case if the area remains a seasonal recreational area.

Reply: It is expected that the Lake Winnecook area will remain a seasonal recreational area, therefore we believe the statement to be correct.

(b) Comment: Believe that "increased public access to Lake Winnecook" will be private, not public as stated.

Reply: If there is a demand, the Town of Unity will allow boat launching along the access road to the drop structure on town-owned land, thus the access would be public, not private.

(c) Comment: Believe that "recreational access improved in the construction area" is probably true but dollar value is low.

Reply: Concur, but no dollar value was placed on this effect since no recreational benefits were claimed.

3) Comment: If these effects continue to be claimed, they should be offset by "adverse effects" such as "increased recreational traffic, town services, and tourism in the area."

Reply: Concur. These effects were added to the EIS. (see p. 47)

4) Comment: Suggest we add 5 acres to publicly-owned land for the Sandy Stream Boat Access Site.

Reply: Concur. Five acres were added and the discussion expanded to include the boat access site. (see p. 16)

5) Comment: The boat launch site was not constructed in expectation of the watershed project.

Reply: Concur. The sentence was deleted from the EIS.

Maine Department of Environmental Protection, Commissioner

1) Comment: "The clearing and snagging of 1500 feet of channel is opposed. Valuable fish cover would be removed which would manifest itself in a reduced carrying capacity of the section for fish. This in turn would effect waterfowl and wildlife populations in this area."

Reply: The draft EIS, page 30, stated: "Clearing and snagging upstream from Prairie Road will remove obstructions which serve as cover and resting places for fish and other wildlife."

Discussion in the final EIS (see pp. 3 and 40) has also been expanded to point out that clearing and snagging will be selective and will involve seven areas totaling 1,500 feet, containing only a few trees in each area. Possible mitigation measures are discussed. (also applies to comments 2a, b, and c.)

- 2) Comment: Also opposed is 9,500 feet of channel enlargement and realignment for the following reasons:

- (a) Comment: The proposed action would create aesthetic pollution by replacing a natural scenic meandering stream with a straight, artificial runoff ditch.

Reply: The draft EIS (page 30) stated: "The visual aesthetics in the channel area will be changed from one of a slow-moving meandering stream with heavily vegetated banks, to one showing the effects of widening and straightening.

One bank will be maintained in its natural state, the other will have plantings of wildlife shrubs and grasses."

- (b) Comment: Valuable fish cover, such as undercut banks, stumps, and snags would be reduced, thus reducing carrying capacity. Total fish and waterfowl habitat would be reduced by replacing 5,900 feet of stream with 2,700 feet of ditch.

Reply: The draft EIS (page 30) states: Channel work "will result in a reduction of smallmouth bass and brook trout habitat" and "there will be a loss of fish and wildlife in the immediate area of the channel." Also 3,000 feet (10 acres) of the cutoff channels will be covered with backwater and will not be lost as habitat, although the use may be by different species than at present. We don't believe loss of habitat can be measured only in feet, but is an interplay of many factors.

The "Fish and Wildlife Resources" section of the EIS has been expanded to better define fisheries resources. The "Environmental Impact" section has been expanded to reemphasize the mitigation measures planned: leaving trees on the south bank where possible, overblasting of the bottom to leave rock rubble or overhangs, construction of pools and riffles, selected placement of boulders and log and tree cover, etc. These measures, as planned by fisheries biologists, may improve conditions above the present.

- (c) Comment: During construction siltation would increase greatly which would probably destroy any brook trout spawning areas and greatly alter benthic communities downstream.

Reply: The draft EIS (pages 30 and 31) discusses the loss of fish and wildlife, quantities of sediment produced, and an on-going survey of the benthic invertebrate community. However, the spawning areas affected would be those for warm-water species such as smallmouth bass and pickerel. Input from the Maine Department of Inland Fisheries and Game does not mention the presence of any brook trout spawning habitat in Twentyfive Mile Stream. The draft EIS (page 16) states "Twentyfive Mile Stream below Prairie Road is not suitable as a trout and salmon nursery area. Low flows, warm water, and improper bottom type contribute to poor spawning conditions." The project may improve conditions for trout. A program to monitor the benthic community is underway and will continue beyond the construction period.

- 3) Comment: The use of the stream as a receiving water for the Unity Sewage Treatment Plant would be altered as to its assimilative capacity.

Reply: The effects of construction will decrease the assimilative capacity until such time as the stream characteristics are restored to a more natural state. It is not expected that the project action will be detrimental to the long-term water quality of Twentyfive Mile Stream.

- 4) Comment: In order to circumvent these impacts but still provide some degree of flood protection to cottages, the alternative of connecting Sandy Stream with Twentyfive Mile Stream below Prairie Road via a floodway would be more acceptable. This action would divert approximately 50-60 percent of the runoff around Lake Winnecook and result in less damage to the environment.

Reply: This alternative is not viable economically, engineering-wise, or environmentally. An additional floodway alternative has been studied since the draft EIS was distributed for review.

It is difficult to physically position the floodway on the land because of a lack of topographic character. Numerous reinforced concrete grade control structures would be required to establish a stable grade. In order to by-pass the flood flows the banks would have to be five feet above present ground elevation and the floodway would require an 80-foot bottom width. A bridge would have to be constructed over it on Prairie Road. A dam would have to be constructed on Sandy Stream north of Route 139 to prevent flood flows from reaching Lake Winnecook. The floodway would be aligned through the Sandy Stream Recreational Area and a new location would have to be found for the boat launching facilities.

Additional channel work would have to be done on Twentyfive Mile Stream since a 100-year level of protection could not be given to all camps and cottages on Lake Winnecook even though more than 50 percent of the runoff would be diverted. This diversion would roughly double the renewal time and reduce the flushing action on Lake Winnecook.

Finally, Sandy Stream upstream from Lake Winnecook is recognized as a "good brook trout stream" (draft EIS, p. 16). The floodway alternative would require work on that stream in addition to Twentyfive Mile Stream which is not a good trout stream. The effects on brook trout, which have been a major concern of many comments, would be much more adverse than with the proposed project.

- (5) Comment: Under no circumstance should further cottage development be allowed on Lake Winnecook. Although naturally meso-trophic to eutrophic, the lake is under severe cultural stress from agricultural activities and camp septic tanks. Of the 278 camps and year-round homes on the lake, 80 percent have septic systems despite the fact that 96 percent of the soils are unsuitable for this method of disposal. In addition, over 50 percent of these are over 10 years old and probably malfunctioning. Bacteriological testing showed that all incoming tributaries running by clusters of camps were contaminated with sewage and therefore a source of nutrients to the lake (Rabeni, 1974). In addition there is aesthetic pollution with increased development of the shoreline.

Reply: The Watershed Work Plan Agreement (Work Plan, page 3, item 11) between SCS and the sponsors states "The Sponsoring Local Organization will be responsible for the land adjacent to Lake Winnecook to prevent any future permanent development from occurring below elevation 180 feet mean sea level.

The draft EIS (page 29) states: The local sponsoring organization" will prevent development in the flood prone area," and "about 40 acres of forest land around Lake Winnecook may be developed as shore-front cottages as a result of the project." The same document (page 32) is specific in placing responsibility for all new development on the towns involved.

Any inferences that new development will absolutely occur have been changed to reflect the possibility of such development, if approved by the towns.

We feel that recent, strict environmental legislation including the Shoreland Zoning Act, revised State Plumbing Code, and the Site Selection Law can have only favorable effects on Lake Winnecook if enforced by the municipalities and other responsible agencies.

Mr. Rabeni's survey - "Winnecook - A Look at a Lake" - which is alluded to, recommends the following:

"However, unless there is a program of environmental maintenance there will be an ever increasing rate of shoreline development, sewage contamination, and an accelerated deterioration of the lake for any recreational use. A master plan for the area must be initiated which investigates and coordinates all aspects of the problem, from land use in the watershed to the regulation of toilet facilities. This plan must have support of the three towns bordering the lake.

This report represents a first step in a recovery program, but only through an enlightened and committed citizenry will the lake be saved for future generations."

It would appear that this watershed project, requested and sponsored by the towns around Lake Winnecook, is in harmony with the recommendations of Mr. Rabeni.

In addition, Mr. Rabeni's report, which is referenced in one comment, states (p. 31), "The polluted waters," (incoming tributaries), "were quickly diluted when they reached the lake and no open water areas were ever found to be contaminated with sewage (fecal coliform) bacteria." The stream pollution exceeds legal limits only during the period of high seasonal use in the "summer". Lake Winnecook has a "B-1" water quality classification.

Maine Department of Environmental Protection, Bureau of Land
Quality Control, Director

1) Comment: No comment.

Reply: We thank the DEP, BLQC for its review.

Maine Department of Environmental Protection, Bureau of Land
Quality Control, Enforcement Division

1) Comment: Enclosed information sheets on laws to make us aware that we must submit applications for approval prior to construction.

Reply: Applications for the required permits have been initiated by the Sponsors.

Maine Department of Health and Welfare

- 1) Comment: Support the project since it protects health and safety of property owners.

Reply: We appreciate the Department's positive position and thank them for the review.

Maine Department of Inland Fisheries and Game

- 1) Comment: Reference to 35,000 square yards of nursery area. This was a factor only when we were experimentally stocking Winnecook Lake with salmon. This experiment was not successful and we accordingly withdrew our request for fishways in the outlet structures. The overblasted rock will serve as a food producing area but will not be brook trout nursery area because of shallow water, low flows and high summer temperature. Warm water fish will use deeper areas as nursery area.

Reply: Concur. Included the last two sentences of the comment in the EIS. (see p. 6)

- 2) Comment: Twentyfive Mile Stream does support a fair early season brook trout fishery--summer flows and temperature are the limiting factors.

Reply: Added to the EIS. (see p. 18)

- 3) Comment: Halfmoon and Sandy Streams are not stocked annually, "irregularly" would be a more accurate description.

Reply: Corrected in the EIS. (see p. 18)

- 4) Comment: Recreational resources should include a comment that Twentyfive Mile Stream is popular with a small number of canoeists.

Reply: Added to the EIS. (see p. 19)

- 5) Comment: We do not have any data on loss of warm water reproduction due to fluctuating water levels. Even if 25 acres are affected, we cannot state that this is a significant factor to the populations of Winnecook Lake.

Reply: Corrected in the EIS. (see p. 30)

- 6) Comment: Wildlife habitat may well be improved by this project.

Reply: We appreciate the Department's objectivity in making such a comment.

- 7) Comment: Fisheries habitat and aesthetics of the habitat appear to be reduced by this project.

Reply: Mitigation measures and design considerations planned with assistance from concerned parties will minimize this reduction in habitat and aesthetics.

- 8) Comment: The land treatment aspects of this project, for which \$747,700 is allocated, may well be the deciding factor in a final decision on total beneficial and detrimental effect. Reduction of erosion from agricultural land and forestry operations and better handling of manure may have significant, long-range, beneficial effects on streams and the lake. The volume and scope of these land treatment practices and how rapidly they are applied would be vital considerations.

Reply: The land treatment measures have been planned to be installed equally over a five year period so that they will all be installed by the end of channel construction. About \$150,000 per year for the five-year period is an estimated expenditure for land treatment.

- 9) Comment: This Department has never recommended this project. We have reacted to it.

Reply: If we have said either implicitly or explicitly that the Department recommends the project we apologize. However, it should be noted that the Department has also participated in project formulation, field reviews, meetings with sponsors, and review of draft documents.

- 10) Comment: Taken in the broadest sense, some effects will probably be favorable, but they seem more related to a cost-benefit analysis than an environmental discussion.

Reply: Correct. These are "Economic and Social "effects which must be included in our analysis.

- 11) Comment: Is it absolutely certain that land treatment practices will be applied in a manner and volume necessary to improve 27,300 acres?

Reply: The following paragraphs from the Watershed Work Plan Agreement clarify the intent of making sure that these practices will be applied as planned:

7. The Sponsoring Local Organization will obtain agreements from owners of not less than 50 percent of the land above each reservoir and floodwater retarding structure, that they will carry out conservation farm or ranch plans on their land.

8. The Sponsoring Local Organization will provide assistance to landowners and operators to assure the installation of the land treatment measures shown in the watershed work plan.
9. The Sponsoring Local Organization will encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.
14. The watershed work plan may be amended or revised, and this agreement may be modified or terminated only by mutual agreement of the parties hereto except for cause. The Service may terminate financial and other assistance in whole, or in part, at any time whenever it is determined that the Sponsoring Local Organization has failed to comply with the conditions of this agreement.....

Education and persuasion have been effective in obtaining the voluntary installation and maintenance of land treatment measures. Incentive cost-sharing of conservation programs by the Federal Government with individual landusers has helped accelerate implementation of land treatment measures and conservation practices. At the present time there are no laws which dictate that land treatment measures be installed and maintained by all landusers.

- 12) Comment: We assume the increased recreational use will be primarily from the 70 new cottages anticipated.

Reply: Much of the original increased use will result from the 80, not 70, new cottages anticipated. The rest is expected to result from general increased recreational demand.

- 13) Comment: The 35,000 square yards of overblasted rock left in the channel bottom may not be a significant mitigation of fish habitat loss.

Reply: This feature was not claimed as a complete mitigation of fish habitat loss. It is only one of several possible measures that, in total, will minimize losses.

- 14) Comment: The towns have to conform to Shoreland Zoning and the State Plumbing Code whether or not this project is undertaken. They know where the floodplain is now, this project will not delineate it better, only change its location.

Reply: Correct. This effect has been rephrased to 1) provide additional information to aid in land use regulation and 2) restrict development in the 100-year floodplain, through the Work Plan Agreement, as well as through new legislation.

15) Comment: We would add: "Elimination of seasonal flooding on 163 cottage lots may reduce a source of nutrients which contribute to eutrophication of Winnecook Lake."

Reply: This effect has been incorporated into the final EIS.
(see p. 44)

16) Comment: We would add the following adverse effect: The 80 cottages which may be built on the flood-protected lake shore may well contribute to eutrophication--even when in compliance with the State Plumbing Code.

Reply: The intent of the plumbing code is to only permit private sewage disposal systems which eliminate or minimize pollution hazards. Legislation exists which can force compliance with environmental codes and prosecute violators.

17) Comment: We assume that any project work in the lake will require a Great Ponds Act permit from the Department of Environmental Protection and that the stream work will require a Stream Alterations Act permit from this Department. We will be appraising this project again under those statutes.

Reply: The sponsors have initiated action for the required permits.

Maine Department of Transportation, Bureau of Planning

1) Comment: Support the project since it benefits the highway system.

Reply: We thank DOT for their support and review.

Maine State Historic Preservation Officer

1) Comment: Has no concern as SHPO.

Reply: We thank Mr. Mundy for his review and position letter.

Kennebec Valley Conservation Association

1) Comment: Object to changing stream to "Twentyfive Mile-an-hour Ditch".

Reply: With project velocities will range from 1.50 to 4.42 feet per-second, or one to three miles per hour, not 25 miles per hour. These values are for storms with frequencies up to 100 years and are found in Table 3A of the Work Plan.

- 2) Comment: Questions whether some impacts are "environmental".

Reply: Although the questioned impacts were not specified, we believe the KVCA was referring to those impacts not directly related to fish and game. Our guidelines state that we must consider the "total environment", which includes man.

The KVCA also recognizes this in their informational leaflet when they discuss "Maine's economic base" and "the protection of the total environment against undue encroachment, in recognition of the public interest, the health of its citizens, and their general welfare." The questioned impacts are probably those of an "Economic and Social" nature, and as such, they must remain in the EIS.

- 3) Comment: Questions the impact of flood waters on downstream areas.

Reply: Present and with-project discharges were discussed on page 5 and tabulated on page 6 of the draft EIS. Peak discharges will be less for all storms greater than the one-year frequency storm. Design velocities appear in Table 3A of the Work Plan.

- 4) Comment: Wonders if effluent from Unity's sewage treatment plant will have to be piped to the new channel.

Reply: The outfall for the plant is in an area of the stream which will not be relocated, only deepened. The outfall pipes and headwall will have to be lowered and possibly extended to reach the pilot channel and ensure constant submergence of the smaller outfall pipe as designed. See EPA comment 2 for details on the sewage treatment plant.

- 5) Comment: Questions why the KVCA was not consulted.

Reply: We apologize for not consulting the KVCA directly. There was no intent to slight any interested group. Please note that the EIS refers to attendance by the local fish and game club (Kanokolus Fish and Game Association) at a project meeting on September 30, 1968. The Maine Department of Inland Fisheries and Game and the U. S. Fish and Wildlife Service have been actively involved in project formulation since the application was approved in October 1965. Representatives of seven private conservation-oriented organizations were invited to attend an informational field trip through the watershed on December 16, 1974 and comment on the January 1975 draft EIS.

North Kennebec Regional Planning Commission

- 1) Comment: No opportunity to review the EIS as requested.

Reply: We regret the NKRPC was unable to respond.

State Biologists' Association

- 1) Comment: Clearing and snagging of the 1,500 foot channel would remove fish cover and consequently reduce the carrying capacity of this portion of the stream for fish.

Reply: The draft EIS, page 30, stated: "Clearing and snagging upstream from Prairie Road will remove obstructions which serve as cover and resting places for fish and other wildlife."

Discussion in the final EIS (see pp. 3 & 40) has also been expanded to point out that clearing and snagging will be selective and will involve seven areas totaling 1,500 feet, containing only a few trees in each area. Possible mitigation measures are discussed.

- 2) Comment: The 9,500 feet of channelization would have an adverse aesthetic effect on the stream and would produce essentially an artificial ditch.

Reply: The draft EIS (page 30) stated: "The visual aesthetics in the channel area will be changed from one of a slow-moving meandering stream with heavily vegetated banks, to one showing the effects of widening and straightening.

One bank will be maintained in its natural state, the other will have plantings of wildlife shrubs and grasses."

- 3) Comment: Fish cover in the 9,500 foot channel area would be reduced due to both the removal of cover and the shortening of the stream itself.

Reply: The draft EIS (page 30) states: Channel work "will result in a reduction of smallmouth bass and brook trout habitat" and "there will be a loss of fish and wildlife in the immediate area of the channel." Also 3,000 feet (10 acres) of the cutoff channels will be covered with backwater and will not be lost as habitat, although the use may be by different species than at present. We don't believe loss of habitat can be measured only in feet, but is an interplay of many factors.

The "Fish and Wildlife Resources" section of the EIS has been expanded to better define fisheries resources. The "Environmental Impact" section has been expanded to reemphasize the mitigation measures planned: leaving trees on the south bank where possible, overblasting of the bottom to leave rock rubble or overhangs, construction of pools and riffles, selected placement of boulders and log and tree cover, etc. These measures, as planned by fisheries biologists, may improve conditions above the present.

- 4) Comment: Siltation during the construction period would adversely affect the environment with a probable destruction of brook trout spawning areas and benthic alteration.

Reply: The draft EIS (pages 30 and 31) discusses the loss of fish and wildlife, quantities of sediment produced, and an on-going survey of the benthic invertebrate community. However, the spawning areas affected would be those for warm-water species such as smallmouth bass and pickerel. Input from the Maine Department of Inland Fisheries and Game does not mention the presence of any brook trout spawning habitat in Twentyfive Mile Stream. The draft EIS (page 16) states "Twentyfive Mile Stream below Prairie Road is not suitable as a trout and salmon nursery area. Low flows, warm water, and improper bottom type contribute to poor spawning conditions." The project may improve conditions for trout. A program to monitor the benthic community is underway and will continue beyond the construction period.

- 5) Comment: The project would alter the characteristics of the stream affecting its ability to assimilate the output of the Unity Sewage Treatment Plant.

Reply: The effects of construction will decrease the assimilative capacity until such time as the stream characteristics are restored to a more natural state. It is not expected that the project action will be detrimental to the long-term water quality of Twentyfive Mile Stream.

- 6) Comment: Additional cottage development will have an adverse ecological and aesthetic influence on the lake. The danger of hastening and exacerbating eutrophication of the lake by additional cottage development is evident in Mr. Charles Rabeni's recent Survey of Lake Winnecook, yet this project makes available 40 acres of wildlife habitat for as many as 80 camp sites.

Reply: It is not the intent of this project to encourage future development in the flood-prone area. On the contrary, the draft EIS (page 29) states that the sponsors will prevent development in the flood-prone area; also, item 11 of the Watershed Work Plan Agreement will prevent development below elevation 180 feet msl. The recent Maine State Plumbing Code, Mandatory Shoreland Zoning Act, and the Site Location Law combine to give the State and its municipalities the power to control undesirable development. All future development must comply with this legislation. It should be noted that there are many reasonably environmentally safe, approved methods of private sewage disposal which do not require septic tank and leach field systems. A good deal of future development could occur if such systems are used.

The Watershed Work Plan Agreement (Work Plan, page 3, item 11) between SCS and the sponsors states "The Sponsoring Local Organization will be responsible for the land adjacent to Lake Winnecook to prevent any future permanent development from occurring below elevation 180 feet mean sea level.

The draft EIS (page 29) states: The local sponsoring organization" will prevent development in the flood prone area," and "about 40 acres of forest land around Lake Winnecook may be developed as shore-front cottages as a result of the project." The same document (page 32) is specific in placing responsibility for all new development on the towns involved.

Any inferences that new development will absolutely occur have been changed to reflect the anticipation of such development.

We feel that recent, strict environmental legislation including the Shoreland Zoning Act, revised State Plumbing Code, and the Site Selection Law can have only favorable effects on Lake Winnecook if enforced by the municipalities and other responsible agencies.

Mr. Rabeni's survey - "Winnecook - A Look at a Lake" - which is alluded to, recommends the following:

"However, unless there is a program of environmental maintenance there will be an ever increasing rate of shoreline development, sewage contamination, and an accelerated deterioration of the lake for any recreational use. A master plan for the area must be initiated which investigates and coordinates all aspects of the problem, from land use in the watershed to the regulation of toilet facilities. This plan must have support of the three towns bordering the lake.

This report represents a first step in a recovery program, but only through an enlightened and committed citizenry will the lake be saved for future generations."

It would appear that this watershed project, requested and sponsored by the towns around Lake Winnecook, is in harmony with the recommendations of Mr. Rabeni.

In addition, Mr. Rabeni's report, which is referenced in one comment, states (p. 31), "The polluted waters," (incoming tributaries), "were quickly diluted when they reached the lake and no open water areas were ever found to be contaminated with sewage (fecal coliform) bacteria." The stream pollution exceeds legal limits only during the period of high seasonal use in the "summer". Lake Winnecook has a "B-1" water quality classification.

- 7) Comment: Changes in the hydraulic characteristics of Twentyfive Mile Stream will seriously affect the flushing characteristics of the lake. A decrease in the annual flushing may hasten eutrophication due to a build-up of nutrients.

Reply: By reducing lake stages and the length of time flood waters will be stored in the lake, the flushing action within Lake Winnecook should be increased not decreased. By not flooding septic systems, the introduction of nutrients would decrease. By reducing the detention times of floodwaters, less time would be available for the settling out of suspended particulate matter.

- 8) Comment: "As much, if not more, water will course through Twenty-five Mile Stream in less time following the project, yet evidence that the stream bed below the channelization area will adequately handle the storm runoff is lacking, as is assurance that the stream will not require further environmental modification to prevent downstream flooding all the way to the Sebasticook River."

Reply: The same volume of water (for any given storm) will flow through Twentyfive Mile Stream with the project as at present. Both the duration of flood flows and the peak discharges will be reduced for all storms greater than a one-year frequency. Because peak discharges will be reduced, flooding will be reduced downstream. Pages 5 and 6 of the draft EIS discuss the operation and functioning of the floodwater retarding structure. The table on page 6 shows the with and without project discharges.

- 9) Comment: A reduction in lake level fluctuation will tend to force the wetland areas around the outlet into a terrestrial succession and thus eliminate a productive area for wildlife support.

Reply: Page 27 of the draft EIS states an opposing view:
"According to the U. S. Fish and Wildlife Service and the Maine Department of Inland Fisheries and Game, fluctuating lake levels have a detrimental effect on fish spawning and waterfowl nesting. The exposure of previously submerged spawning areas produces a kill on about 25 acres annually. Waterfowl habitat around the lake is also affected by the drying out of previously flooded wetland." Page 32 states "Submerged aquatic plants should grow more abundantly along the shoreline and provide more waterfowl feed, and feed and cover for fish." "The stabilized water levels should provided better nesting conditions for ducks. The reduced fluctuation will also provide a better situation for shoreline and marsh-spawning fish. Exposure of these spawning areas in the past, has led to destruction of eggs deposited during periods of spring high water."

The following discussion was added to the final EIS (see p. 42):

"A diverse terrestrial ecosystem will be encouraged in the woodland areas adjacent to and between Sandy Stream and Twentyfive Mile Stream as a result of reducing the frequency and duration of flooding. Flooding is a limiting factor in the establishment and growth of many terrestrial plants. More plants will be established and the area will be more productive because of improved site conditions. More plant, seed and fruit production and better growth will create a diverse and productive wild-life habitat."

- 10) Comment: Further, since the discharge characteristics of the Unity Sewage Treatment Plant are predicated on the present hydraulics of Twentyfive Mile Stream, what will happen as a result of the channelization is a matter of grave concern.

Reply: The plant was designed for 2,500 people or an inflow capacity of 250,000 gal/day. This equals an average discharge of 0.39 cfs. Present loading is between 20,000 to 30,000 gal/day for an average discharge of 0.039 cfs. When Unity College closes for the summer, this decreases further.

Two lagoons cover an area of 25 acres, have an operating depth of five feet, and have 3:1 side slopes. The bottom is gravel and cobbles. Detention time is 260 days and there is complete separation between storm and septic waste.

The chlorination station is about 1,000 feet from the stream. At the present discharge rate, no chlorine

residue was found at the outfall with normal chlorine treatment. The sewer district stores effluent in the two lagoons for three or four months, then chlorinates it and releases it into the stream at a rate of about 0.5 cfs.

The outfall is located at a section of Twenty-five Mile Stream which will not be relocated. However, the bed will be lowered from an elevation of about 165 feet msl to 162.6 feet msl. The bottom of the footing on the outflow headwall is 167.56 feet msl. The invert of the small outflow pipe, which was designed to always be submerged, is 169.80 feet msl, and that of the large outflow pipe is 170.69 feet msl. Normal water surface is at about 170 feet msl.

Either the headwall and pipe section to the first manhole will have to be rebuilt or the pipes extended to the pilot channel to ensure constant submergence of the outfall.

The total volume of water passing through the stream will be essentially the same upon completion of the project as before. The velocity of the stream during passage of the 100-year flood will be increased by 1.73 fps to 3.22 fps. The increased velocities will improve the mixing of the effluent with the stream water and result in an improvement in water quality.

The effects of construction will limit the physical and biological diversity of the stream and, therefore, its assimilative capacity, until such time as the stream characteristics are restored to a more natural state.

It is not expected that the project action will be detrimental to the long-term water quality of Twenty-five Mile Stream.

- 11) Comment: Several of the "favorable environmental effects" listed in the draft EIS are of questionable pertinence to the environment, even if favorable in some other sense. "Increased employment opportunities during construction and maintenance of the structures" can hardly be construed as a favorable environmental effect. Nor can "increased trafficability, access, and safety on currently flood-prone roads" and "increased standard of living for low-

income farmers" be a significant favorable effect on the environment. Indeed, "increased public access" to Lake Winnecook and an "improved recreational access to the construction area along Twentyfive Mile Stream" will in all probability have an adverse effect on the environment.

Reply: The questioned effects are "Economic and Social" in nature must be included to comply with SCS guidelines. We must consider the total environment of which man's well being is an important element. Many effects which appear adverse to one group are favorable to another. The final EIS was revised to reflect opposing points of view in many instances.

12) Comment: How will 800 acres of wetland be affected by the project?

Reply: The draft EIS (page 31) describes the effects on the wetlands. Additional information has been added to the final EIS. (see pp. 39-42, 45-47)

13) Comment: Confusion arises from listing the removal of wildlife cover upstream from Prairie Road as an adverse effect and listing the improvement of wildlife access along the channel as a favorable effect.

Reply: The "improvement of wildlife access along the channel" has been deleted. As stated, a change in wildlife habitat will occur that will benefit some species and be detrimental to others. Much of the discussion in the "Environmental Impacts" section deals with these changes.

14) Comment: The Environmental Impact Statement seems to be used here primarily as a justification or rationalization of the project since it is largely devoted to proclaiming the benefits to be derived from the project rather than to an analysis of environmental impact.

Reply: The EIS describes the impacts of the proposed action - both beneficial and adverse.

15) Comment: The EIS credits the project with providing towns with the basic information necessary for shoreland zoning, yet Unity voted on a shoreland zoning ordinance on March 15, 1975 that had already been prepared without benefit of such data.

Reply: The SCS provided a plan map of the project area depicting the 100-year flood lines on Twentyfive Mile Stream and around the outlet of Lake Winnecook to the Town of Unity

in 1970. Flood profiles and elevations by storm frequency on Lake Winnecook were also provided at that time through the Waldo County Soil and Water Conservation District. The same information was provided to Mr. Charles Rabeni in 1973 while he was doing a resource inventory of the lake. The first draft of the work plan was prepared in 1971 and has been presented at several public meetings since then. Additional information from the soil survey and revised data from detailed design stages will also be available at a later date.

- 16) Comment: This plan was developed without even consulting the Unity Planning Board within the last two years.

Reply: This plan was essentially formulated by 1971 and has been undergoing various stages of review since then. Contact has been maintained with the project sponsors, including the Town of Unity, whenever necessary.

- 17) Comment: Several errors are readily apparent in the draft EIS. (see letter, p. C-49).

Reply: Concur. The errors have been corrected. However, Mr. Charles Rabeni also did water quality monitoring work and benthic invertebrate studies (while a graduate student at the University of Maine) under contract with the Soil Conservation Service after the work done on Lake Winnecook under the Title 1 Grant was completed. Most of this was performed in laboratories at the University of Maine or the Maine Department of Environmental Protection.

- 18) Comment: The December 1974 draft EIS is totally inadequate.

Reply: Opinion noted.

- 19) Comment: Perhaps the SCS has become committed to support the project before thoroughly evaluating its environmental consequences.

Reply: The SCS was committed to assisting the sponsors in developing a plan that best meets sponsors' original objectives with a minimum of disturbance to the environment, in accordance with the National Environmental Protection Act of 1969.

- 20) Comment: The project will require permits under the Great Ponds Act, the "Bulldozer Law", and the EPA Site Selection Law.

Reply: The sponsors have initiated action for the required permits.

Warwick M. Tinsley

Approved by: _____

Date JUN 25 1976

LIST OF APPENDIXES

Appendix A - Comparison of Benefits and Costs for Structural Measures.

Appendix B - Project Map.

Appendix C - Letters of Comment received on the Draft Environmental
Impact Statement.

Appendix D - Species List.

Appendix E - Electrofishing Survey.

Appendix F - Aquatic Vegetation Study.

Appendix G - Benthic Invertebrate Study.

A

APPENDIX A

COMPARISON OF BENEFITS AND COSTS OF STRUCTURAL MEASURES

APPENDIX A

COMPARISON OF BENEFITS AND COSTS OF STRUCTURAL MEASURES

TWENTYFIVE MILE STREAM WATERSHED, MAINE

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS <u>1/</u>					Average <u>3/</u> Annual Cost	Benefit - Cost Ratio
	Damage Reduction	Changed Land Use	Redevelopment	Secondary	Total		
Total Project	69,850	8,100	13,500	6,050	97,500	56,940	1.7:1.0
Project Administration	xxxx	xxxx	xxxx	xxxx	xxxx	3,860	xxxx
GRAND TOTAL	<u>2/</u> 69,850	8,100	13,500	6,050	97,500	60,800	1.6:1.0

December 1975

- 1/ Price Base: 1974
- 2/ In addition, it is estimated that land-treatment measures will provide flood-damage-reduction benefits of \$250 annually.
- 3/ Cost amortized over 100 years at 6 7/8% interest.

APPENDIX B

PROJECT MAP

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PROJECT MAP

TWENTYFIVE MILE STREAM WATERSHED

KENNEBEC, PENOBSCOT, SOMERSET, AND WALDO COUNTIES, MAINE

Scale 1:25,000
1 0 1 2 3 4 Miles

LEGEND

- Good motor roads
- Railroad
- Power-transmission line
- Streams
- Marsh
- County line
- Township line
- Watershed boundary
- Drainage area controlled by structure
- Area benefited
- D.A. Drainage area in acres

PROJECT MEASURES

- Floodwater retarding structure
- Structure number
- Stream channel improvement for flood prevention



APPENDIX C

LETTERS OF COMMENT RECEIVED ON THE DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Advisory Council
On Historic Preservation

1000 K Street, N.W. Suite 4
Washington, D.C. 20006

March 25, 1975

Richard L. Duesterhaus
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
USDA Office Building
University of Maine,
Orono, Maine 04473

Dear Mr. Duesterhaus:

This is in response to your request of January 17, 1975 received on January 25, 1975, for comments on the environmental statement for the Twentyfive Mile Stream Watershed Project, Waldo, Kennebec, Penobscot, and Somerset Counties, Maine.

Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement is inadequate regarding our area of expertise as it does not contain sufficient information to enable the Council to comment substantively. Please furnish additional data indicating:

Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470[f]). While you have stated that the watershed contains no known historic properties, the Council must have evidence that the most recent listing of the National Register of Historic Places has been consulted (see Federal Register, February 4, 1975, and monthly supplements each first Tuesday thereafter) and that either of the following conditions is satisfied:

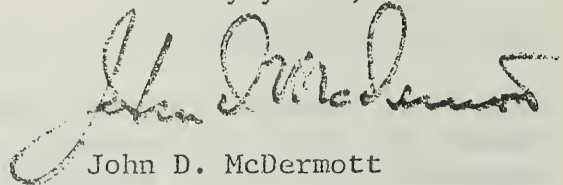
1. If no National Register property is affected by the project, a section detailing this determination must appear in the environmental statement.
2. If a National Register property is affected by the project, the environmental statement must contain an account of steps taken in compliance with Section 106 and a comprehensive discussion of the contemplated effects on the National Register property. (Procedures for compliance with Section 106 are detailed in the Federal Register of January 25, 1974, pp. 3366-3370).

To ensure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council suggests that the environmental statement contain evidence of contact with the appropriate State Historic Preservation Officer and that a copy of his comments

concerning the undertaking upon these resources be included in the environmental statement.

Should you have any questions or require additional assistance, please contact Myra Harrison of the Advisory Council staff at 202/254-3380.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "John D. McDermott". The signature is fluid and cursive, with a large initial "J" and "M".

John D. McDermott
Director, Office of Review
and Compliance

FEDERAL POWER COMMISSION
REGIONAL OFFICE
26 Federal Plaza
New York, New York 10007

February 6, 1975

State Conservationist
Soil Conservation Service
USDA Federal Office Building
Room 202A
Orono, Maine 04473

Re: USDA-SCS-EIS-WS-(ADM)-75-1-(D)-ME.

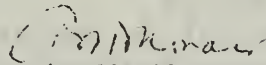
Dear Sir:

This is in response to your letter of January 17, 1975 accompanying the transmittal of an environmental review statement regarding the Twentyfive Mile Stream Watershed Project; Waldo, Kennebec, Penobscot and Somerset Counties, Maine.

The jurisdictional responsibilities of the Federal Power Commission concern the possible effects that developments affecting land and water resources may have on bulk electric power facilities, including potential hydroelectric operations, and over certain interstate aspects of natural gas pipeline facilities. The proposed project would apparently have no significant effect on such facilities.

We appreciate the opportunity to comment on this matter.

Sincerely,


A. M. Monaco
Regional Engineer

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

N. E. Plant, Soil and Water Laboratory
University of Maine
Orono, Maine 04473

February 21, 1975

Mr. Richard L. Duesterhaus
State Conservationist
USDA Office Building
University of Maine
Orono, Maine 04473

Dear Rich:

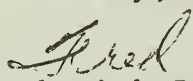
This is my first chance to look at a proposal such as the attached and I found the experience quite interesting. I have to admit to a good deal of ignorance concerning the technical aspects, so I don't feel that I should comment on them.

As an informed layman and sometimes trout fisherman, I am predisposed to cast a jaundiced eye at the rearrangement of streams, but this particular proposal seems well done and accounts for all of the environmental needs I could readily conjure up.

On the Summary Sheet (p. i), Item V, I don't think you have addressed yourself to the subject. There is considerable reason given for the action to proceed, but it is really not a "Summary of Environmental Impact and Adverse Environmental Effects", particularly the latter. When I started reading the Planned Project on p. 2, I began to see impact.

The paragraph at the top of p. 3 seems to be more introductory and contains the first definition of "land treatment", a term mentioned several times. Moving it nearer to the start of the paper would be an improvement. It looks like an interesting project and I see no reason to criticize it or give unfavorable comment.

Sincerely,



Frederick R. Holbrook
Research Entomologist

UNITED STATES DEPARTMENT OF AGRICULTURE

FARMERS HOME ADMINISTRATION

USDA Office Building

Orono, Maine 04473

March 24, 1975

Mr. Warwick M. Tinsley, Jr.
State Conservationist
Soil Conservation Service
USDA Office Building
Orono, ME 04473

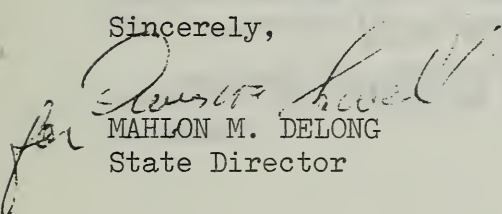
Dear Mr. Tinsley:

We have reviewed the draft environmental impact statement for the Twenty-five Mile Stream Watershed project prepared by your agency in accordance with applicable laws and wish to make the following comments as we understand the project.

Having been involved with assisting the Town of Unity in a new waste treatment plant just recently, we were made well aware of the problems of flooding which have taken place the past years in this town. We feel your service has put together a plan which will cause more favorable affects on the environment as compared to those that would adversely affect the environment.

We certainly agree with this proposal and offer any assistance our agency can provide in bringing this project to the construction stage. Should any of the sponsors wish a Watershed loan from us for their local share of the project, we shall be happy to consider their request.

Sincerely,


MAHLON M. DELONG
State Director

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, D.C. 20310

18

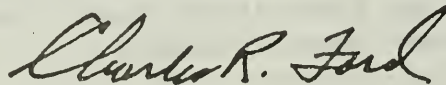
Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D.C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the State Conservationist of Maine by letter of 17 January 1975 requested the views of the Chief of Engineers on the work plan and draft environmental statement for Twentyfive Mile Stream Watershed project, Maine.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department. The draft environmental statement satisfies the requirements of Public Law 91-190, 91st Congress, insofar as this Department is concerned.

Sincerely,



Charles R. Ford
Deputy Assistant Secretary of the Army
(Civil Works)





DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
GOVERNMENT CENTER
BOSTON, MASSACHUSETTS 02203

OFFICE OF
THE REGIONAL DIRECTOR

17 MAR 1975

Mr. Richard L. Duesterhaus
State Conservationist
Soil Conservation Service
Department of Agriculture
USDA Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

HEW's Regional Environmental Council has reviewed the draft Environmental Impact Statement for the Twentyfive Mile Stream Watershed Project, Maine.

On the basis of our review, we have determined that the impacts of the proposed action have been adequately addressed within the scope of this Department's responsibilities.

Thank you for giving us the opportunity to comment on this draft statement.

Sincerely yours

Robert Fulton
Robert Fulton
Regional Director



IN REPLY REFER TO:

United States Department of the Interior

BUREAU OF OUTDOOR RECREATION

NORTHEAST REGIONAL OFFICE

Federal Building - Room 9310

600 ARCH STREET

Philadelphia, Pennsylvania 19106

MAR 18 1976

Mr. Richard L. Duesterhaus
State Conservationist
Soil Conservation Service
USDA Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

We appreciate your request for our comments on the draft environmental impact statement for the Twentyfive Mile Stream Watershed project, Maine.

This Office would like to review your environmental assessments of this project more thoroughly; however, in order to do this adequately, a careful on-site investigation would be required. Due to our present limited budget and manpower, such an investigation is not possible. Therefore, we are unable to comment at this time.

Sincerely,

ANTHONY M. CORBISIERO
DEPUTY Regional Director





United States Department of the Interior

GEOLOGICAL SURVEY

Water Resources Division

State House Annex
Capitol Shopping Center
Augusta, Maine 04330

January 20, 1975


Mr. Richard L. Duesterhaus
State Conservationist
USDA, Soil Conservation Service
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

This office was asked to review the report on Twentyfive Mile Stream Watershed by Mr. Friedman of the Waldo County Soil and Water Conservation District. I am enclosing a copy of that review, which I hope will fulfill your requirements. If a more in-depth review is required, please let us know.

I hope to get to Orono soon and will stop in to visit with your staff.

Sincerely,


C. Russell Wagner
Subdistrict Chief

encl.



United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division

State House Annex
Capitol Shopping Center
Augusta, Maine 04330

November 12, 1974

Mr. Harry F. Friedman, Jr.
Waldo County S & WCD
Box 364
Belfast, Maine 04915

Dear Mr. Friedman:

I have reviewed the work plan and environmental statement for Twenty-five Mile Stream Watershed, and can find no serious technical deficiencies. A search of our backfiles found no evidence of USGS participation in this project, in response to a letter to G. S. Hayes, dated October 26, 1965.

I'm sure that you are aware of two nearby USGS stream monitoring points - Sebasticook River near Pittsfield, a full recording gage operated since 1928, with a full range of statistical data available - and a partial record crest-stage gaging station operated from 1964 to present on Hall Brook at Thorndike (drainage area 5.23 sq. mi.). Data from the latter site is currently being prepared for computer analysis and statistical summaries should be available in the near future.

Hap Hayes retired this summer, and I transferred here from Ithaca, N.Y. in August to take his place. I worked closely on several projects with staff of the Syracuse, N.Y. SCS office and look forward to mutual efforts in the State of Maine. Please contact me at any time that we can be of assistance.

Sincerely,

C. Russell Wagner
Subdistrict Chief

cc: SCS State Cons.



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

SEP 1 1975

PEP ER-75/68

Dear Mr. Duesterhaus:

Thank you for your letter of January 17, 1975, requesting our views and comments on the draft environmental statement and work plan for Twenty-Five Mile Stream Watershed Protection and Flood Prevention Project, Waldo, Kennebec, Penobscot, and Somerset Counties, Maine. Comments on both documents are presented below.

General Comments

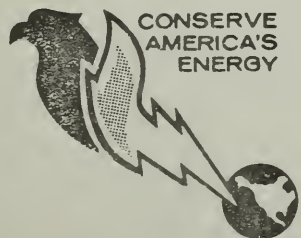
We find the documents to be generally adequate in their consideration of fish and wildlife and outdoor recreation interests.

There are two nearby Geological Survey stream monitoring points: Sebasticook River near Pittsfield, a full recording gage operated since 1928, with a full range of statistical data available; and a partial-record crest-stage gaging station operated from 1964 to the present on Hall Brook at Thorndike (drainage area 5.23 sq. mi.). Data from the latter site is currently being prepared for computer analysis and statistical summaries should be available in the near future.

The proposed project will not have any adverse effect on any existing, proposed, or known potential unit of the National Park System, nor any known historic, natural, or environmental education sites eligible for the National Landmark Program.

Work Plan

We note in the work plan (page 27) that assistance was received from the Maine State Historical Society; yet the draft statement (page 17) bears no evidence of consultation with the State Historic Preservation Officer (Dr. James Mundy, Director, Maine Historical Preservation Commission, 31 Western Avenue, Augusta, Maine 04330). A favorable commentary from that



Save Energy and You Serve America!

official is the Soil Conservation Service's best assurance that no existing or potential sites relating to the National Register of Historic Places will be overlooked. Reference to such contact and a copy of the State Historic Preservation Officer's response should be included in the final environmental statement.

The Soil Conservation Service should be commended for having accomplished an archeological survey for the project area prior to preparation of this draft environmental statement.

Both the work plan and the environmental statement note the sand and gravel resources, but neither discusses how the project measures may restrict their availability. Sand and gravel, and perhaps marble, constitute the only known mineral resources of importance. Our information indicates minor hydrothermal mineralization at two localities within the watershed, but these are of no commercial significance. Since sand and gravel deposits are relatively common throughout Maine, any impact should be slight in view of the small acreage of land involved by project improvements.

Within the context of the first paragraph on page 21, and page 27 of the draft statement, the "drying out" of previously flooded wetlands appears to have only adverse effects. This is not true, as many times artificial draw-down is used to expose wetland areas and facilitate food and cover plant germination. The sentence should be modified to convey some of the beneficial aspects of these "drying out" periods.

The first part of the fifth sentence on page 31, and the third sentence on page 34 of the draft statement, "Wildlife access will be improved along the new channel," should be deleted as there is no evidence to support this statement. The lack of cover, at least initially, will preclude wildlife usage and, in fact, hinder access.

The second sentence, sixth paragraph, on page 42 should include the loss of furbearer habitat. Also, on page 42, sixth paragraph, eighth sentence, in addition to the loss of fish and wildlife, there will be total destruction of existing habitat conditions.

The sentence in paragraph two on page 43, and on page 31, second paragraph of the draft statement, that references "low value" wetland types should refer to value to waterfowl only. In Maine there are at least ten wildlife species, in addition to waterfowl, which utilize Type 6 and 7 wetlands, and find them relatively high in value. The statement should reflect this fact.

The biological study mentioned on page 68 should also include the various aspects of fish and wildlife populations. Especially important are the relative changes in abundance and diversity. It has been shown that significant changes in these phenomena occur along channelized areas (see the Report on Channel Modifications submitted to the Council on Environmental Quality, 1973).

Draft Environmental Statement

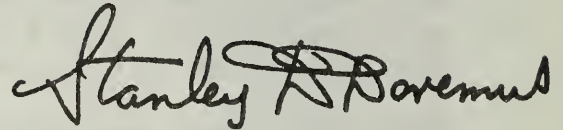
Significant adverse environmental impact related to the geology of the proposed project is not anticipated.

The short-term construction activity should cause little detrimental environmental effect, and the long-term improvements appear positive. The work plan adequately outlines procedures for limiting serious sediment discharge. The long-range concern of degradation of surface and ground-water supplies by increased population will hopefully be offset by increased land-use regulations and Maine's new regulations regarding private sewage disposal systems. Reference to these new regulations would be appropriate.

The first sentence of the first paragraph on page 35 should read, "Removal of fish and wildlife cover," instead of "Removal of wildlife cover. . ." Also, on page 35, the last sentence of the third paragraph should be deleted, as the maintenance of "backwater" is not an adverse effect. In the seventh paragraph, first sentence, the words "low value" should be deleted. In addition, the statement should be expanded to show the loss of wildlife habitat associated with this wetland. The thrust of the ninth paragraph, first sentence, should be expanded to show why the lowering of the water table is an adverse effect.

We hope these comments will be of assistance to you in the preparation of the final documents.

Sincerely yours,

A handwritten signature in dark ink, reading "Stanley D. Boreman". The signature is fluid and cursive, with the first name "Stanley" being more prominent.

Deputy Assistant Secretary

Secretary of the Interior

Mr. Richard L. Duesterhaus
State Conservationist
Soil Conservation Service
Department of Agriculture
USDA Office Building
University of Maine
Orono, Maine 04473



DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

10 FEB 1975

Mr. Richard L. Duesterhaus
State Conservationist
Soil Conservation Service
USDA Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

This is in response to your letter of 17 January 1975 addressed to Commandant, U. S. Coast Guard concerning a draft environmental impact statement for the Twenty-Five Mile Stream Watershed Project, Waldo County, Maine.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W. E. Caldwell

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Environmental
Division
By direction of the Commandant



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION I

Room 2203 - (617)-223-4635

J.F. KENNEDY FEDERAL BUILDING, BOSTON, MASSACHUSETTS 02203

March 20, 1975

Mr. Arthur Dearborn
 U.S. Department of Agriculture
 Soil Conservation Service
 U.S.D.A. Federal Office Bldg., Room 202A
 Orono, ME 04473

RE: Draft EIS for the Twentyfive Mile
 Stream watershed, Maine
 Project No. USDA-SCS-EIS-WS-
 (ADM) 75-1-(D)-ME

Dear Mr. Dearborn:

Having completed our review of the Draft Environmental Impact Statement, we offer the following comments.

The assessment of the flood control project on water quality does not make reference to the effluent discharge from the secondary treatment plant at Unity, Maine which discharges into the portion of the Twenty-five Mile Stream intended to be relocated. What effect will the relocation of the stream channel have upon the flow rate and volume of the stream and how will the effluent be affected?

Furthermore, the floodplain encroachment which has already occurred has initiated a pollution problem from the runoff of the septic tank system leaching fields into the lake (page 26). If future development is to be encouraged to settle in the floodplain due to this project, federal water quality standards may again be violated due to the unsuitability of the soils for septic tank disposal (page 26).

It is our understanding that shoreland zoning has not yet been voted upon by the towns involved. The entire question of the future impact of this project in terms of secondary effects has not been adequately explained.

Until these reservations are clarified, we cannot say the project lacks environmental objections. We have, therefore, rated this draft statement EIR-2 in accordance with our National Rating System, a copy of which is enclosed.

Mr. Arthur Dearborn
March 20, 1975
Page Two

We would appreciate receiving copies of the Final EIS when it is prepared.

If you have any questions on our comments, please let us know.

Sincerely yours,

Wallace E. Stickney

Wallace E. Stickney
Director
Environmental Impact Office

Enclosure

EXPLANATION OF EPA RATINGEnvironmental Impact of the Action

LO -- Lack of Objections

EPA has no objections to the proposed action as described in the draft environmental impact statement; or suggests only minor changes in the proposed action.

ER -- Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating federal agency to reassess these aspects.

EU -- Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

Adequacy of the Impact Statement

Category 1 -- Adequate

The draft environmental impact statement sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 -- Insufficient Information

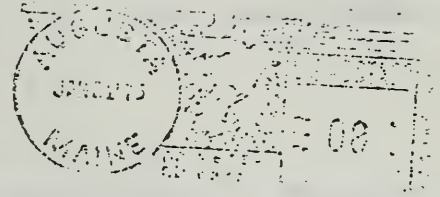
EPA believes that the draft environmental impact statement does not contain sufficient information to assess fully, the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft environmental impact statement.

Category 3 -- Inadequate

EPA believes that the draft environmental impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement.

If a draft environmental impact statement is assigned a Category 3, no rating will be made of the project or action; since a basis does not generally exist on which to make such a determination.

Office of the Governor
State House
Augusta, Maine 04330



Richard L. Duesterhaus
USDA Office Building
UMO
Orono, Maine 04473

Thank you so much for your recent correspondence.

Due to the heavy volume of mail at this time, we are sending this card as an acknowledgement. Should your correspondence require a response, we will be in contact with you as soon as possible. Thank you for your patience.

Again, thank you for keeping us informed and for your helping us try to help Maine.

Best wishes,

James B. Longley
Governor



DEPARTMENT OF CONSERVATION
STATE OFFICE BUILDING
AUGUSTA, MAINE 04330

COMMISSIONER
DONALDSON KOONS. PH.D.

January 23, 1975

BUREAU OF
PARKS AND RECREATION
TELEPHONE 207 - 289-3821
THOMAS D. DICKENS. DIRECTOR

Richard L. Duesterhaus, State Conservationist
Soil Conservation Service
USDA Office Building
University of Maine at Orono
Orono, Maine 04473

Dear Dick:

The Bureau of Parks and Recreation has received and reviewed the second Draft Environmental Statement for the Twenty Five Mile Stream Watershed. On November 15, 1974, we forwarded our comments concerning the first draft to the Waldo County Soil and Water Conservation District.

Our general reaction to the proposal is the same as then, we do not have a direct interest in the project, therefore we have limited our review of the project to its recreational aspects.

We note that the public recreation objective which was in the first draft as objective 4 on page 2, has been removed from the second draft. If it is the intent of the project not to provide additional public recreational areas and facilities, we agree with the removal of the objective. However, with the removal of that objective, we would expect that the three recreational items cited as "Favorable Environmental Effects" on page 34 to be removed or to be altered to reflect private recreational benefits only.

On the surface, these three "Favorable Environmental Effects" would appear to be quite questionable. "Increased recreational use of the area with the resultant increase in tax base and local business" is perhaps the safest of these items. Research is beginning to show, however, that the services for new development often costs more than the taxes received. This is not likely to be the case if this area remains a seasonal recreational development. It could become the case if the area becomes a year-round development.

There certainly does not appear to be any "increased public access to Lake Winnecook," what appears to be provided is private access. The item, "Recreational access improved in the construction area" is probably true, but I would suspect its dollar value to be very low.

If these items continue to be claimed as Favorable Effects, then they should be balanced on the "Adverse Environmental Effects" side of the ledger by such statements as "Increased recreational traffic in the area," "Increased town services in the area," and/or "Increased Tourism in the area."

Richard L. Duesterhaus

Page 2

January 23, 1975

On page 14, we suggest you add five acres to the first paragraph under "Economic Data," for the Sandy Stream Boat Access Site administered by the Bureau of Parks and Recreation.

Concerning page 16, we make the same comment that we made on November 15, "to the best of our knowledge, the Sandy Stream boat launch facility was not constructed in expectation of implementation of the watershed project."

Finally, we recognize and appreciate the statement concerning the Maine Statewide Comprehensive Outdoor Recreation Plan (SCORP) on page 27. The need for day-use facilities within the area still exists. If you feel that there is a suitable site in the area for a public day-use facility for such activities as picnicking or swimming, please contact Norm Manwell of this Bureau, as he has the responsibility for seeking such sites.

Sincerely,



Thomas J. Cieslinski
Environmental Resource Planner

TJC/jk



STATE OF MAINE

Department of Environmental Protection

WILLIAM R. ADAMS, JR.
COMMISSIONER

ADMINISTRATION
289-2811

February 6, 1975

BUREAUS OF:

AIR QUALITY CONTROL
289-2437

LAND QUALITY CONTROL
289-3762

WATER QUALITY CONTROL
289-2591

Mr. Richard L. Duesterhaus
State Conservationist
USDA Office Building
University of Maine
Orono, Maine : 04473

MAIN OFFICE:
STATE HOUSE
AUGUSTA 04330

Dear Mr. Duesterhaus:

REGIONAL OFFICES:

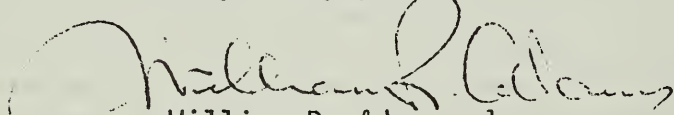
BANGOR
31 CENTRAL STREET
BANGOR 04401
947-6746

PORTLAND
415 CONGRESS STREET
PORTLAND 04101
775-6587

PRESQUE ISLE
634 MAIN STREET
PRESQUE ISLE 04769
764-3737

Thank you for a copy of the "Draft Environmental Statement for Twentyfive Mile Stream Watershed". Members of the Water Bureau staff have reviewed the report. I am passing their comments on to you in the attached February 3, 1975 memo from Mower and Scott to King.

Very truly yours,


William R. Adams, Jr.
Commissioner

CHK:sib

cc: Administrator, Soil Conservation Service, Washington, D.C.

Inter-Departmental Memorandum Date February 3, 1975

Charlie King

Dept. Environmental Protectionm Barry Mower, Matthew ScottDept. " "Subject Twenty-Five Mile Stream Watershed Project

The staff has reviewed the Environmental Impact Statement and offers the following comments:

The greatest benefit from this project as proposed would be flood protection for cottages on Lake Winnecook. Although this project was first proposed 10 years ago and people must have been well aware of the problems, property owners have continued to build in the 100 year floodplain, and have even installed septic tanks in the floodplain, which is now forbidden under the new State Plumbing Code.

The installation of land treatment measures, construction of a box inlet drop structure, and a type-C drop structure are appropriate courses of action which may be carried out with a minimum of damage to the environment.

The clearing and snagging of 1500 feet of channel is opposed. Valuable fish cover would be removed which would manifest itself in a reduced carrying capacity of the section for fish. This in turn would effect waterfowl and wildlife populations in this area. The benefits to be gained do not warrant a disturbance of this magnitude.

Also opposed is 9500 feet of channel enlargement and realignment for the following reasons:

1. The proposed action would create aesthetic pollution by replacing a natural scenic meandering stream with a straight, artificial runoff ditch.
2. Valuable fish cover, such as undercut banks, stumps, and snags would be reduced, thus reducing carrying capacity.
3. Total fish and waterfowl habitat would be reduced by replacing 5900

4. During construction siltation would increase greatly which would probably destroy any brook trout spawning areas and greatly alter benthic communities downstream.
5. The use of the stream as a receiving water for the Unity Sewage Treatment Plant would be altered as to its assimilative capacity.

In order to circumvent these impacts but still provide some degree of flood protection to cottages, the alternative of connecting Sandy Stream with Twenty-five Mile Stream below Praire Road via a floodway would be more acceptable. This action would divert approximately 50-60 percent of the runoff around Lake Winnecook and result in less damage to the environment.

Under no circumstance should further cottage development be allowed on Lake Winnecook. Although naturally meso-trophic to eutrophic, the lake is under severe cultural stress from agricultural activities and camp septic tanks. Of the 278 camps and year-round homes on the Lake, 80 percent have septic systems despite the fact that 96 percent of the soils are unsuitable for this method of disposal. In addition, over 50 percent of these are over 10 years old and probably malfunctioning. Bacteriological testing showed that all incoming tributaries running by clusters of camps were contaminated with sewage and therefore a source of nutrients to the lake (Rabeni, 1974). In addition there is aesthetic pollution with increased development of the shoreline.

The staff feels that flood protection can be realized in the manner proposed without sacrificing the environment of Twenty-five Mile Stream.

Literature Cited

Rabeni, C.F. 1974. Winnecook - A Look at a Lake. Unity College, Unity, Maine. 44pp.



STATE OF MAINE

Department of Environmental Protection

WILLIAM R. ADAMS, JR.
COMMISSIONER

February 13, 1975

ADMINISTRATION
289-2811

BUREAUS OF:

AIR QUALITY CONTROL
289-2437

LAND QUALITY CONTROL
289-3762

WATER QUALITY CONTROL
289-2591

MAIN OFFICE:
STATE HOUSE
AUGUSTA 04330

REGIONAL OFFICES:

BANGOR
31 CENTRAL STREET
BANGOR 04401
947-6746

PORTLAND
415 CONGRESS STREET
PORTLAND 04101
775-6587

PRESQUE ISLE
634 MAIN STREET
PRESQUE ISLE 04769
764-3737

Mr. Richard L. Duesterhaus
State Conservationist
U. S. Dept. of Agriculture
USDA Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

Regarding your letter of January 17, 1975, and the attached environmental impact statement for the Twenty-five Mile Stream Watershed, this Bureau has no comments.

Sincerely,

Henry E. Warren, Director
Bureau of Land Quality Control

HEW:jp



STATE OF MAINE

Department of Environmental Protection

WILLIAM R. ADAMS, JR.
COMMISSIONER

February 13, 1975

ADMINISTRATION
289-2811

BUREAUS OF:

AIR QUALITY CONTROL
289-2437

LAND QUALITY CONTROL ✓
289-3762

WATER QUALITY CONTROL
289-2591

MAIN OFFICE:

STATE HOUSE
AUGUSTA 04330

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BANGOR

31 CENTRAL STREET
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PORTLAND 04101
775-6587

PRESQUE ISLE

634 MAIN STREET
PRESQUE ISLE 04769
764-3737

Mr. Richard Duesterhaus
State Conservationist
Soil Conservation Service
U.S.D.A. Office Building
University of Maine
Orono, Me. 04473

Dear Mr. Duesterhaus:

I had a call from Dr. Jan Sassaman of Unity College yesterday, inquiring about a project to involve stream alteration, dam construction and other work proposed as a flood control project on Lake Winnicook in Unity.

From our conversation I believe that some of the work may come within jurisdiction of the Site Location Law and The Great Ponds Act. I am sure that you are aware of the Stream Alteration Law administered by the Department of Inland Fisheries and Game which also may apply to the project.

I have enclosed General Information sheets on our laws to make you aware of them so that if they do apply to the project you can submit an application for approval prior to construction and avoid any problems.

If you have any questions on this please let me know

Sincerely,

Hollis A. McGlaufflin
Director of Enforcement Division

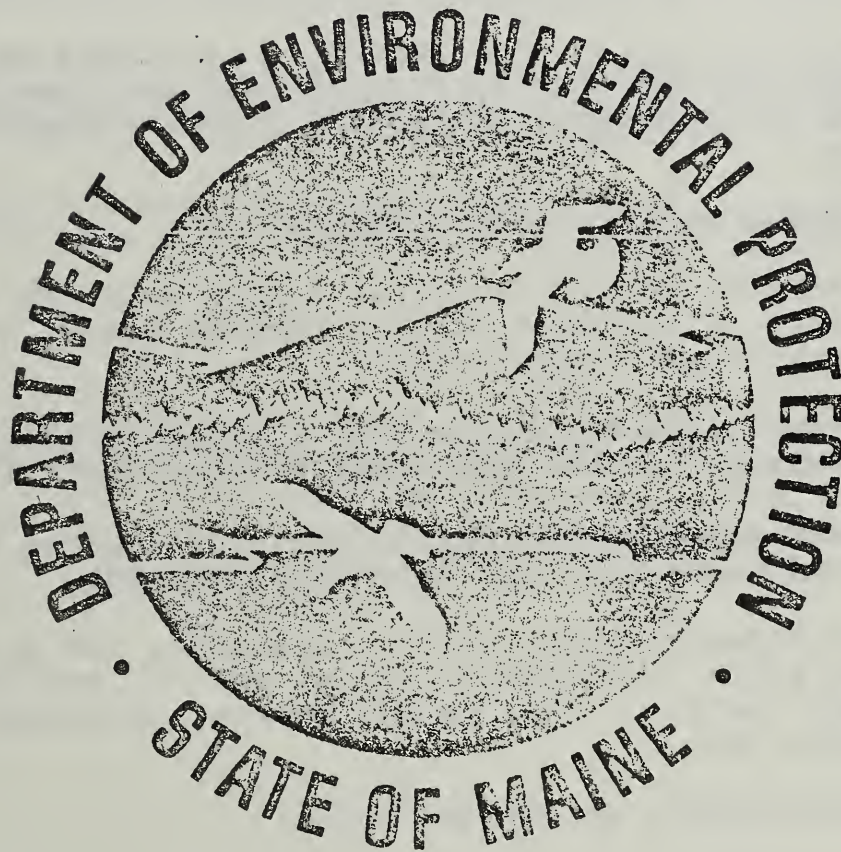
HAM:rlc

Enclosure

GENERAL INFORMATION ON LAWS

ADMINISTERED BY

BUREAU OF LAND QUALITY CONTROL



ENFORCEMENT DIVISION
MARCH 1974

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUGUSTA, MAINE 04330



GENERAL INFORMATION ON THE SITE LOCATION LAW,
TITLE 38, SECTION 481-488

WILLIAM R. ADAMS, JR.
COMMISSIONER

The following is information on the Site location Law which became effective January 1, 1970. The information is generalized to help in making people aware of the law, to prevent violation of the law, to prevent violation due to ignorance of the law and to prevent environmental damage which might result if the law is ignored. We, at the Department of Environmental Protection would appreciate any help you can give us in making people aware of this law.

This law requires anyone who intends to construct or operate a development to submit an application and gain approval from the Board of Environmental Protection prior to construction or operation.

Activity covered by this law includes:

1. Development which occupies a land or water area in excess of .20 acres such as camping areas, shopping centers, ski areas, etc.
2. Gravel or borrow areas over 5 acres if they are not regulated by the Department of Transportation.
3. Those developments which require a license from the Board such as an air emissions license.
4. Developments which involve reshaping the surface of the earth in excess of 60,000 sq. ft. and including roads, parking lots, tennis courts, buildings, lawn areas, etc.
5. Subdivisions as defined below:

The division of a parcel of land into (1) five or more lots, (2) any one of which is less than 10 acres and (3) if the lots make up an aggregate land area of more than 20 acres and (4) are to be offered for sale or lease to the general public during any 5 year period.

Activity which does not require approval:

1. Subdivisions of less than 5 lots.
2. Subdivisions in which all of the lots are over 10 acres in size.
3. Subdivisions which are less than 20 acres in size.

SITE LOCATION LAW

-2-

4. Subdivisions in which the lots are transferred in a will or are given away (unless the intent is to avoid the Site Location law.)
5. To be classed as a subdivision the development must meet all of the criteria in #5 above.

In general, unless the activity is a large and obvious violation, some investigation and research is required to determine that a violation exists. In most instances of possible violations or reported violations you should contact the Department of Environmental Protection, Bureau of Land Quality Control, State House, Augusta, or telephone 289-3762.

To obtain an application form for applying under this law contact the Department of Environmental Protection, State House, Augusta, Maine, 04330, or telephone 289-3762.

If you have questions about the law or wish to discuss it feel free to stop in at the D.E.P. office or telephone 289-3762

(NOTE:)

The Municipal Subdivision law, which is administered by the municipalities and the Attorney Generals office, requires municipal approval for subdivision of a parcel of land into 3 or more lots and in general anyone who proposes to subdivide a parcel into 3 or more lots should contact the municipal officials in order to comply with that law.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUGUSTA, MAINE 04330



WILLIAM H. ADAMS, JR.
COMMISSIONER

GENERAL INFORMATION ON THE MINIMUM LOT SIZE LAW,
TITLE 12, CHAPTER - 423-A

The following is information on the Minimum Lot Size Law which became effective on October 3, 1973. The information is generalized to help in making people aware of the law, to prevent violation due to ignorance of the law and to prevent environmental damage which might result if the law is ignored. We, at the Department of Environmental Protection would appreciate any help you can give us in making people aware of this law.

The law requires that lots used for single family housing and upon which sewage is disposed of by the underground method, (this includes out houses), have at least 20,000 sq. ft. and if the lot has frontage on a pond, lake, stream, river, or tidal area it shall further have at least 100 feet of frontage.

The law requires that lots used for multiple unit housing and other land use activity (such as apartment houses, motels, camping areas, etc.) and upon which sewage is disposed of by the underground method have at least 20,000 sq. ft. for each 300 fallons per day of sewage output. If the lot has frontage on a pond, lake, river, stream, or tidal area it shall further have 100 ft. of frontage for each 300 gallons per day of sewage output.

Sewage output for single family housing is figured at 300 gallons per day. Sewage output for multiple unit housing is figured at 120 gallons per bedroom. Sewage output for other land use acitivity is figured at the actual engineering computations or measurement.

Lots of less than 20,000 sq. ft. and less than 100 ft. frontage can be used for underground sewage disposal only if the lot is approved in writing by the Board of Environmental Protection.

This law does not apply to lots served by a municipal or quasi-municipal sewer system nor to any system licensed under Title 38, Section 413 having a waste discharge license.

This law does not apply to lots upon which sewage was being disposed of prior to October 3, 1973. The law does not apply to lots in existence prior to January 1, 1970 by virtue of a deed or instrument conveying the lot to the owner such as a valid and enforceable agreement for purchase and sale or was shown on a legally recorded plan prior to January 1, 1970, provided, however, that contiguous lots in the same ownership on or after October, 1973 shall be considered as one lot. Under this provision any minimum size lot created out of the area considered as one lot must be approved in writing by the Board prior to being used for sewage disposal by the underground method.

MINIMUM LOT SIZE LAW

-2-

This law does not regulate the sale of lots.

To obtain approval for lots having less than the required 20,000 sq. ft. or less than the required 100 ft. frontage on water, a person should obtain an application from the Department of Environmental Protection, State House, Augusta, Maine, 04330, and submit it along with information to demonstrate that the sewage system proposed will not lower the water quality or otherwise pose a threat to any lake, pond, stream, river, tidal waters, underground water supply or to the public health, safety, and general welfare. Around 30 days is required to process the application.

No fee is required for applying for approval of lesser sized lots.

Violations of this law makes a person subject to a \$1,000.00 fine and each day of violation shall be considered a separate offense and the Board may seek an injunction to prevent or abate a violation of this law.

In addition to fines, title searches done for lending institutions have resulted in disapproval of loans to build on less than minimum size lots which have not been approved by the Board of Environmental Protection under this law.



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUGUSTA, MAINE 04330

WILLIAM R. ADAMS, JR.
COMMISSIONER

GENERAL INFORMATION ABOUT THE COSTAL WETLANDS ACT,
TITLE 12, CHAPTER 421, SECTION 4701

This law requires that anyone who intends to fill, dredge, permanently alter or deposit septic sewage into the intertidal area first obtain a permit or approval from the Board of Environmental Protection and the town government before the construction or alteration takes place.

A tidal wetland is defined as "any swamp, marsh, bog, beach, flat or other contiguous lowland above extreme low water which is subject to tidal action or normal storm flowage at anytime excepting periods of maximum storm activity." In other words the statute regulates the area from extreme low water to extreme high water on all of the Maine coast and up all the rivers and streams in Maine to the Head of Tide.

An area is "subject to tidal action" if it can be shown that:

- a. Salt and or brackish water plants are present on the area.
- b. A depression fills with water that is salty to taste.
- c. If the tide can be seen to rise and fall over an area in its normal yearly cycle.
- d. The debris normally deposited at the high tide line are present where the alteration is taking place.

Examples of projects covered by this law are:

1. Wharves and piers, boat hauls and docks.
2. Retaining walls and revetments of wood, rock, concrete, steel, etc.
3. Deposition of fill into an intertidal area or dredging material from an intertidal area such as sand, mud, or beach rocks.
4. Construction of boat ramps and piling structures.
5. Deposition of sewerage and or other septic waste into the intertidal area.

There is an exemption clause in the Wetland law which allows the normal maintenance of existing ways such as roads and railroads and public utility right of ways. That exemption, however, only applies when no watercourse is to be substantially altered. As a rule of thumb, if the area is as it was before October 7, 1967 and the owner is not expanding it but just performing normal upkeep, he will not need to apply for approval. If his "upkeep" expands the project farther into the intertidal area, however, he will need a permit.

If you see a violation of the Wetland Control Act or one is reported to you, you should:

COASTAL WETLANDS ACT

-2-

1. Advise the owner of the land and the man doing the work that they may be in violation of the Wetland law and suggest that they stop long enough to check. They can call 289-3762, Augusta.
2. Make a note of the day, time, and the name of the person you spoke to. Note what you said to him and give a general description of what he is doing. If there is any heavy machinery present take the name of the company from the side of it and describe what the machine is doing.
3. Notify the local Marine Resources warden of the possible violation. You can find out who he is by calling , 289-2291, Augusta.
4. Send your notes, the names of the people you contacted, your name or the name of the complainant, the name of the violator and any other information including drawings or photographs, to Enforcement Division, Bureau of Land Quality Control, D.E.P. State House, Augusta, Maine, 04330 or call 289-3762 and give the information. The most important thing to remember is that we need to know where the violation is and who is doing it.

The Marine Resources Wardens are able to issue summons under this law, as are all police officers. They are also able to determine what is a Wetland and what isn't or can contact a biologist who can.

Application and approval are the best ways to apply this law. Knowing the law and being able to apply it correctly will help the State retain its wetland resource. The easiest part of Enforcement is education because fewer violations and less destruction will occur if the public knows of the law and the reason behind it.

To apply under the Wetlands Act contact the Department of Environmental Protection, State House, Augusta, Maine, 04330. Telephone 289-3762 for an application. The application must be submitted and gain approval of both the Municipal government and the Board of Environmental Protection prior to beginning construction.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
AUGUSTA, MAINE 04330

GENERAL INFORMATION AND ENFORCEMENT PROCEDURE
ON THE GREAT PONDS LAW, TITLE 38, SECTION 422



VILLIAM R. ADAMS, JR.
COMMISSIONER

The following is information on the Great Ponds Law which became effective in its present form on September 21, 1971. The information is designed to help in making people aware of the law, to prevent violation due to ignorance of the law, to clarify our enforcement procedure and to prevent environmental damage which might result if the law is ignored. We at the Department of Environmental Protection would appreciate any help you can give us in making people aware of the law.

The law requires anyone who proposes to dredge, fill or construct a permanent structure on, over or abutting a Great Pond to submit an application and gain approval from the Board of Environmental Protection prior to construction.

A Great Pond is any natural pond with a surface area in excess of 10 acres or any artificially formed pond with a surface area in excess of 30 acres, the shore of which is owned by two or more owners.

Activity covered by this law includes:

1. Construction of boathouses.
2. Construction of retaining walls.
3. Depositing of fill in the pond or near enough to the pond and in a manner such as to cause erosion of the fill into the pond.
4. Construction of permanent docks.
5. Dredging for any purpose, such as to deepen the pond, create a channel, marina, etc.
6. Placing sand to create sandy beaches or bulldozing the shore area.
7. Construction of boat ramps.

Activity which does not require approval:

1. Temporary structures (those structures which are removed from the pond for more than five (5) months in any calendar year.
2. Floats which are removed during the winter months.

If you see a violation or one is reported to you, you should: _____

1. Tell the person causing the violation about the law and suggest that he stop, and that he contact the D.E.P. office at 289-3762, if he has not gained Board approval.
2. Make a note of the date and time which you talked with the violator and what you told him.
3. Notify the local game warden of the violation (you can find out who he is by calling 289-3371).

(Please turn over)

4. Send your notes, who you notified, name of violator and name of complainant to Enforcement Division, Bureau of Land Quality Control, D.E.P., State House, Augusta, Maine, or call 289-3762 and relay the information. Be sure to include enough information so we can contact the individual or find the site.

The Department of Inland Fisheries and Game Wardens will issue citations in cases of violations of this law. The contractor doing the work as well as the landowner, can be cited for violation. The minimum fine under the statute is \$100.00.

The following steps will be taken to prosecute a violator and obtain restoration of the affected area, consistent with the statutory requirements:

1. The Department of Inland Fisheries and Game warden will notify the Department of Environmental Protection that a citation will be issued along with the following information:
 - a. The full name of the violator and contractor who performed the work.
 - b. The name of the pond, name of the town and name of the country where the activity occurred.
 - c. The name of the landowner upon which the activity occurred.
2. The Department of Environmental Protection will search its records and if no permit exists, will issue an affidavit to the warden certifying that no permit has been issued to the violator.
3. The Department of Inland Fisheries and Game warden will issue a citation to the violator. The contractor doing the work as well as the landowner may be cited for violation.
4. The violator will appear in court and the court will hand down a judgment in the case. The minimum fine under the statute is \$100.00.

After court action is complete, the Department of Inland Fisheries and Game warden will notify the Department of Environmental Protection of that fact. The D.E.P. will request the violator to submit an after-the-fact application for the project and the following action will be taken.

1. The Department of Environmental Protection will process the application and will either (1) deny the application and order specific reclamation of the affected area with a specified time set forth in the order, (2) approve the application, or (3) order a public hearing and so notify the applicant by certified mail.
2. If the applicant does not submit an after-the-fact application within the time limit specified, the D.E.P. will prepare the case and submit it to the Attorney General's office for legal action.
3. The Attorney General's office will bring a Civil Action against the violator and sue for restoration of the affected area.
4. A very good informational booklet "Protecting Your Lake" which explains the reasons for the law, tells how to apply, and includes a copy of the statute, is available from the D.E.P., Bureau of Land Quality Control, State House, Augusta, Maine, 04330. The booklet is also available in bulk quantities from the Natural Resources Council, 20 Willow Street, Augusta, Maine, price is 13¢ each.



STATE OF MAINE
DEPARTMENT OF HEALTH AND WELFARE
AUGUSTA, MAINE 04330

DEAN FISHER, M. D.
COMMISSIONER

February 4, 1975

Mr. Richard L. Duesterhaus
State Conservationist
USDA Office Building
University of Maine
Orono, ME 04473

Subject: Twentyfive Mile Stream Watershed Project

Dear Mr. Duesterhaus:

This letter is to offer favorable comment to the subject project. Such a project reduces the incidence of well/spring contamination and damage to private sewage disposal systems that often results from flooding. In as much as this project would serve to protect the health and safety of the property owners, we are in favor of it.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Raymond E. Hammond".

Raymond E. Hammond
Sanitary Engineer
Division of Health Engineering

REH/mm



DEPARTMENT OF

INLAND FISHERIES AND GAME

STATE OFFICE BUILDING
AUGUSTA, MAINE 04330

YARNARD F. MARSH
Commissioner

April 22, 1975

J. WILLIAM PEPPARD
Deputy Commissioner

Mr. Warwick M. Tinsley, Jr.
State Conservationist
Soil Conservation Service
USDA Office Building
University of Maine at Orono
Orono, Maine 04473

Dear Mr. Tinsley:

Here is our evaluation of the draft Environmental Impact Statement for the Twenty-five Mile Stream Watershed Project. Much of our comment is similar to those already presented.

The following are comments on specific items:

- pg. 4 Reference to 35,000 square yards of nursery area. This was a factor only when we were experimentally stocking Winnecook Lake with salmon. This experiment was not successful and we accordingly withdrew our request for fishways in the outlet structures. The overblasted rock will serve as a food producing area but will not be brook trout nursery area because of shallow water, low flows and high summer temperature. Warm water fish will use deeper areas as nursery area.
- pg. 16 Twenty-five Mile Stream does support a fair early season brook trout fishery--summer flows and temperature are the limiting factors. Halfmoon and Sandy Streams are not stocked annually, "irregularly" would be a more accurate description.
- pg. 17 Recreational resources should include a comment that Twenty-five Mile Stream is popular with a small number of canoeists.
- pg. 27 We do not have any data on loss of warm water reproduction due to fluctuating water levels. Even if 25 acres are affected, we cannot state that this is a significant factor to the populations of Winnecook Lake.

General comments:

1. Wildlife habitat may well be improved by this project.
2. Fisheries habitat and esthetics of the habitat appear to be reduced by this project.
3. The land treatment aspects of this project, for which \$747,700 is allocated, may well be the deciding factor in a final decision on total beneficial and detrimental effect. Reduction of erosion from agricultural land and forestry operations and better handling of manure may have significant, long-range, beneficial effects on streams and the lake. The volume and scope of these land treatment practices and how rapidly they are applied would be vital considerations.
4. This Department has never recommended this project. We have reacted to it.

Comments on favorable and adverse environmental effects (pgs. 34 and 35):

We will refer to these statements as if they were numbered to save time.

Under favorable effects:

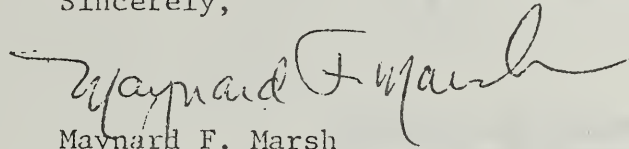
1. Taken in the broadest sense, numbers 1, 7, 9, 13 and 16 will probably be favorable environmental effects, but they seem more related to a cost-benefit analysis than an environmental discussion.
2. The use of will in statement No. 1 is quite strong. Is it absolutely certain that these practices will be applied in a manner and volume necessary to improve 27,300 acres.
3. Under No. 8, we assume this increased recreational use will be primarily from the 70 new cottages anticipated.
4. Under No. 11, the 35,000 yards of nursery area may not be a significant mitigation of fish habitat loss.
5. Under No. 16, the towns have to conform to Shoreland Zoning and the State Plumbing Code whether or not this project is undertaken. They know where the flood plain is now, this project will not delineate it better, only change its location.
6. We would add a No. 17. Elimination of seasonal flooding on 163 cottage lots may reduce a source of nutrients which contribute to eutrophication of Winnebago Lake.

Under adverse effects:

1. We would add a No. 12. The 70 cottages which may be built on the flood-protected lake shore may well contribute to eutrophication--even when in compliance with the State Plumbing Code.

We assume that any project work in the lake will require a Great Ponds Act permit from the Department of Environmental Protection and that the stream work will require a Stream Alterations Act permit from this Department. We will be appraising this project again under those statutes.

Sincerely,

A handwritten signature in cursive script, reading "Maynard F. Marsh".

Maynard F. Marsh
Commissioner

MFM:CFR/mmg

cc: Boettger
Bond
Augusta Headquarters
Supervisor - Tobie
District Warden - J. Ford
Boothby - SWCC

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION

STATE OFFICE BUILDING

AUGUSTA, MAINE

04330

ROGER L. MALLAR
Commissioner

March 18, 1975

Mr. Richard L. Duesterhaus
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
USDA Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

Thank you for the opportunity for this department to comment on the draft environmental impact statement on the Twentyfive Mile Stream Watershed project.

We are well aware of the chronic flooding in that watershed and of the associated deleterious effects upon our highways. We do wish to express support for the project because of its anticipated benefits upon the highway system and to note that final arrangements concerning maintenance of the proposed Prairie Road bridge and control structure and regarding use of Bridge Act funds should be explored and finalized with the Maine Department of Transportation.

Again, thank you for the opportunity to comment. I hope these comments prove of some value to you.

Very truly yours,

MAINE DEPARTMENT OF TRANSPORTATION
Bureau of PlanningA handwritten signature in dark ink, appearing to read "Daniel Webster, Jr.", followed by a large, stylized flourish.

Daniel Webster, Jr.
Director

WFR/el

MAINE HISTORIC PRESERVATION COMMISSION

31 WESTERN AVENUE
AUGUSTA, MAINE 04330

H. MUNDY
DIRECTOR

AREA CODE 207
289-2133

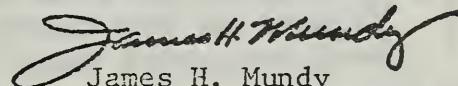
April 10, 1975

Mr. Arthur Dearborn III
Watershed Planning Staff Leader
U.S.D.A. Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Dearborn:

I can find no impact upon any sites listed on the National Register of Historic Places or sites that meet the criteria for such designation by the Twentyfive Mile Stream Watershed Project. As Dr. Sanger of this Commission has already found no impact upon any archeological sites, I have no further concern as State Historic Preservation Officer.

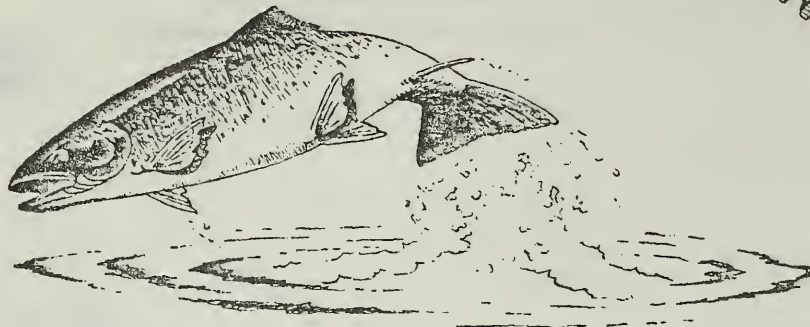
Sincerely yours,



James H. Mundy
State Historic Preservation
Officer

lh:JM

C-42
KENNEBEC VALLEY CONSERVATION
ASSOCIATION



P.O. BOX 525
SKOWHEGAN,
MAINE 04976

18 March 1975

Mr. Richard L. Duesterhaus
State Conservationist
Soil Conservationist *Service*
U.S.D.A. Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Duesterhaus:

The "Draft Environmental Impact Statement" for the Twenty-five Mile Stream Project has come to the attention of our association, and the matter was brought up at the KVCA Annual Meeting last evening in Skowhegan.

The KVCA voted to express grave concern about and opposition to the proposed project; we object to plans to channalize large portions of that meandering stream to turn it into a "Twenty-five Mile-an-hour Ditch" ? Specifically, the KVCA:

- (1) questions some of the so-called "environmental" benefits listed in the draft statement; benefits they may be, but environmental they are not!
- (2) questions the impact of flood waters, normally impounded in Lake Winnecook, on the Town of Burnham, which is downstream to (but not included in) the study area;
- (3) questions the fate of the sewage treatment effluent from the Town of Unity's treatment plant if the ditch you propose to dig is constructed; wouldn't the effluent have to be piped to the new channel?
- (4) questions why the KVCA was not consulted, as we maintain an interest in all conservation activities in the Kennebec Watershed (see attached leaflet).

Thank you for your consideration of this matter, and we would appreciate a reply to this letter.

Sincerely,

Eugene Hilinski
S. Eugene Hilinski
Vice-President

SEH/wg

encl:

- Franklin
 - Rangeley, Kingfield, Strong, Phillips, Weid, Wilton, Farmington, New Sharon
- Kennebec
 - Waterville, Winslow, Oakland, Benton, Clinton, Albion, China, Vassalboro, Sidney, Belgrade, Rome, Augusta
- Piscataquis
 - Dexter, Corinna, Newport, Plymouth, Etna, Dixmont, Greenville
- Somerset
 - Skowhegan, Fairfield, Madison, Norridgewock, Solon, Bingham, Moscow, The Forks
- Waldo
 - Palermo, Unity, Thorndike, Burnham

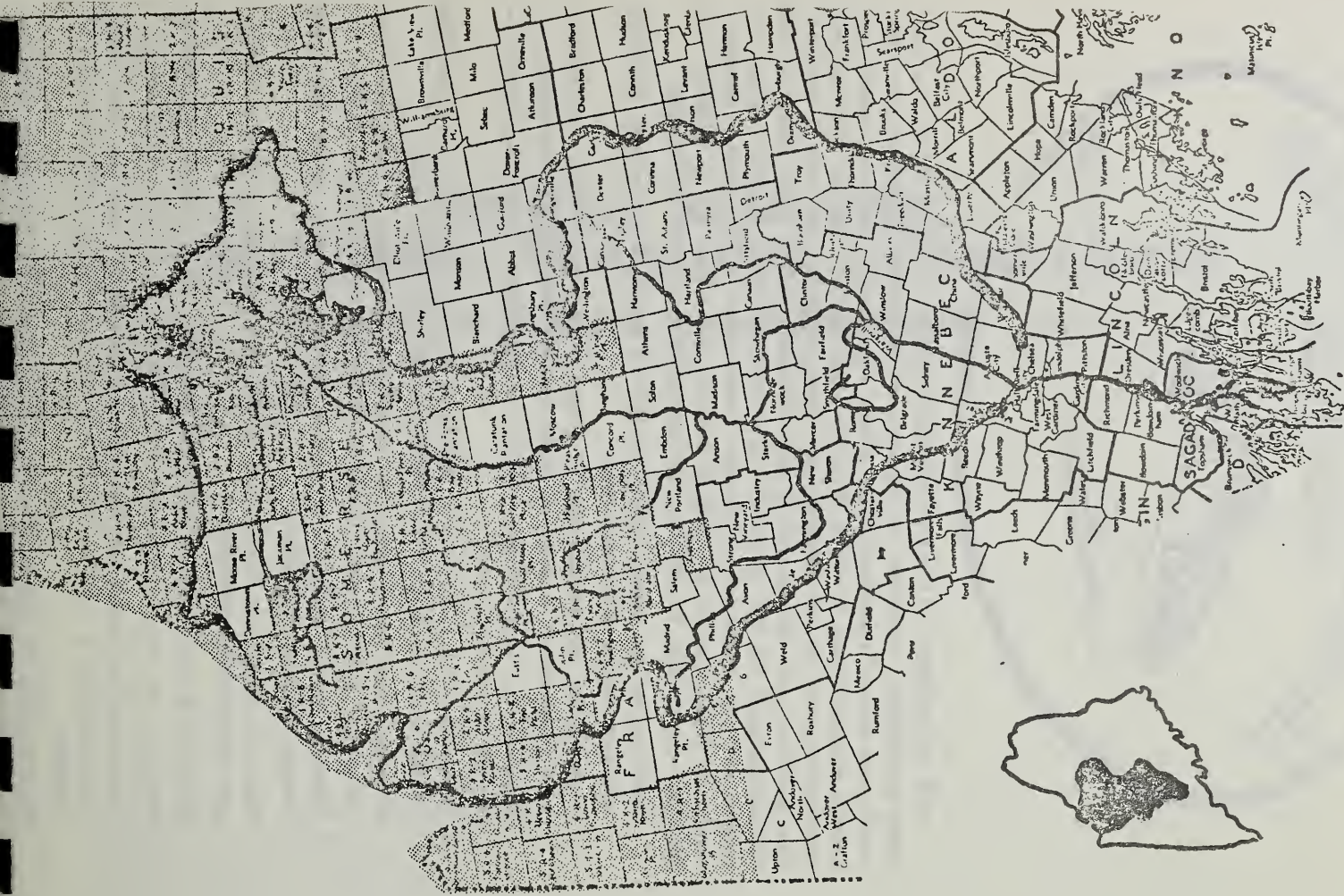
REGIONAL PLANNING COMMISSIONS

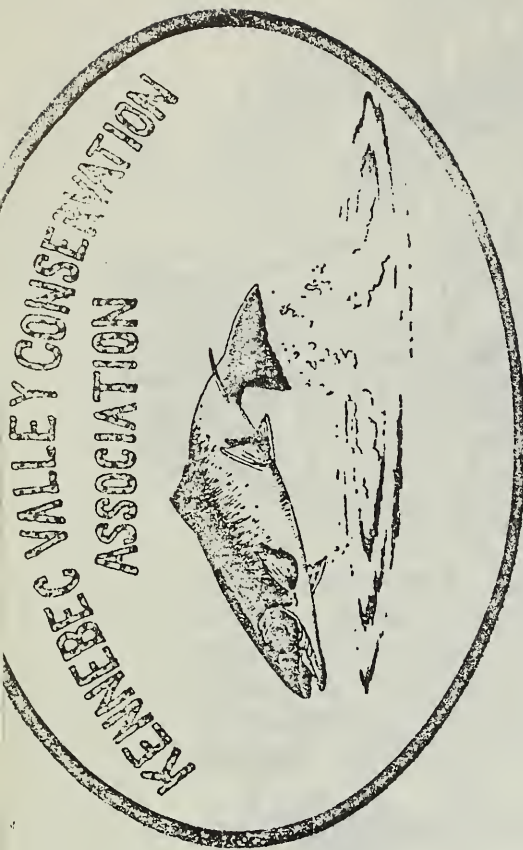
- Androscoggin Valley
- North Kennebec
- Southern Kennebec Valley

Shaded zone: Unorganized territories under the Land Use Regulation Commission

K.V.C.A. COMMITTEES

Public Relations	Tom Gordon	872-9736	public information and education
Finance	Win Kelley	453-2584	supervising KVCA financial operations
Fish & Wildlife	Peter Davis	672-3208	protecting deerherd and other management problems
Anti-Pollution	Bill Perry	643-2901	municipal sewage, salt, pesticides, etc.
Land Use	Bill Gilbert	873-1131	land development, scenic roads, clearcutting, etc.
River Corridor	Clint Townsend	474-9411	zone of selective usage along the river bank





THE KENNEBEC VALLEY CONSERVATION ASSOCIATION is a non-profit organization, dedicated to the aims of reclaiming, protecting, and preserving the natural resources of the Upper Kennebec Valley. We believe that Maine's economic base is rooted in a kind and bountiful nature, and that her environment and natural resources are being subjected to constant degradation, pollution, and desecration in the Kennebec Valley. The policy of this Association shall be the restoration and conservation of Maine's natural resources and the protection of its total environment against undue encroachments, in recognition of the public interest, the health of its citizens, and their general welfare. In meeting this responsibility, the Association is:

- *Working for the speedy ending of the log drives and the least polluting alternate means of transportation.
- *Fighting for the preservation of scenic country roads from unnecessary over-development, a cause in which the Association leads the state.
- *Studying the multi-faceted problem of deer herd decline and allied interests of the sportsman.
- *Recommending that definite standards for the practice of clearcutting be set up by the large paper companies and then adhered to.
- *Planning the logical series of controlled developments with the least amount of environmental intrusion in the Kennebec Corridor Plan.
- *Pressing action against any known violators of state septic tank and sewage disposal regulations.
- *Recommending that every town in the Kennebec Valley form a municipal conservation commission.
- *Advocating environmental education programs for all schools in the area.
- *Studying the natural resources and potentials of the Kennebec Valley.
- *Informing the public of significant environmental problems and news by publishing a regular newsletter and supplying public speakers if possible.
- *Coordinating the efforts of other organizations and individuals with the same aims as the Association, to encourage new conservation organizations.

Please enroll me as a member of the KVCA. I enclose annual dues:
 Single \$2.50 ☐ Sponsoring \$7.50 ☐ Contributing \$25 ☐ Patron \$100
☐ Organization Memberships: State-wide \$25 ☐ Local \$10 ☐.
 Also enclosed is an additional \$..... to further the work of the KVCA.

Name

Address

I want to help! I am interested in working with the

..... Committee.

Kennebec Valley Conservation Association

NORTH KENNEBEC REGIONAL PLANNING COMMISSION

16½ BENTON AVENUE · WINSLOW MAINE · 04902

DIANNE E. STETSON
CRIMINAL JUSTICE COORDINATOR
TELEPHONE 872-7819

ELERY KEENE
PLANNING DIRECTOR
TELEPHONE 873-0711


April 9, 1975

Richard L. Duesterhaus
State Conservationist
USDA Office Building
University of Maine
Orono, Maine 04473

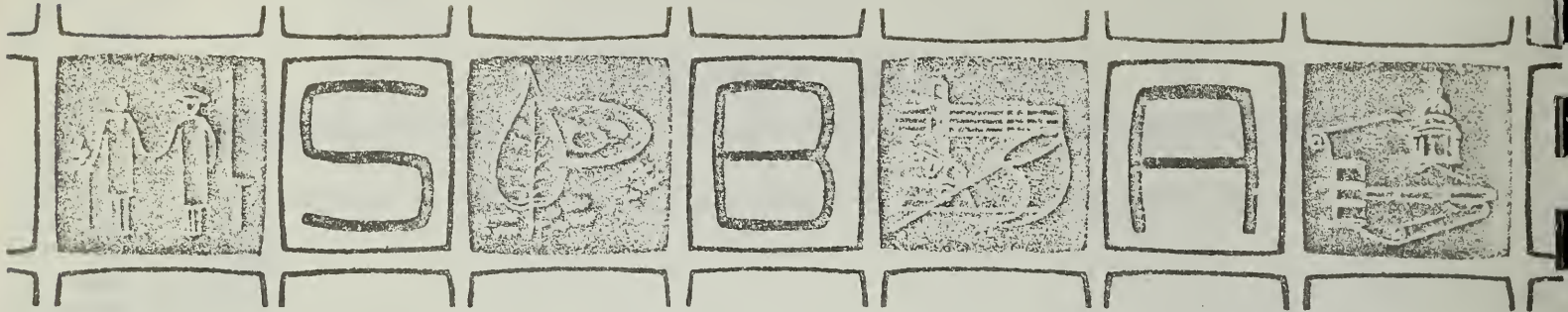
Dear Mr. Duesterhaus:

We appreciate receiving a copy of your Draft Environmental Impact Statement for Twentyfive Mile Stream Watershed, Maine. We regret we have not had an opportunity to conduct a review due to other activities of even more pressing importance to our planning program.

Sincerely,


W. Elery Keene
Planning Director

WEK:jb



STATE BIOLOGISTS' ASSOCIATION

BOX 646 - SANFORD, MAINE 04073 Center of Environmental Science
17 March 1975 Unity College
Unity Maine 04988

Mr. Warwick Tinsley
State Conservationist
Soil Conservation Service
U.S.D.A. Office Building
University of Maine
Orono, Maine 04473

Dear Mr. Tinsley:

The enclosed letter addressed to Mr. Richard Duesterhaus concerns the December 1974 Environmental Impact Statement for the Twenty-five Mile Stream Watershed project.

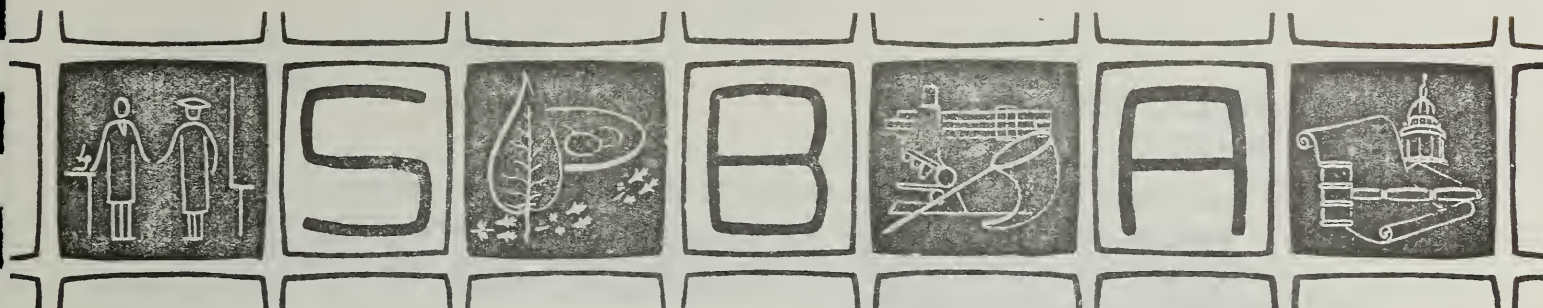
If you have any questions, please call me.

Sincerely,

A handwritten signature in cursive script, reading 'Jan F. Sassaman', is written over the word 'Sincerely,'.

Jan F. Sassaman, Ph.D.
State Biologists Association Board of Directors

cc: Dr. William Gilbert, President S.B.A.



STATE BIOLOGISTS' ASSOCIATION

BOX 646 - SANFORD, MAINE 04073 Center of Environmental Science
 11 March 1975 Unity College
 Unity, Maine 04988

Mr. Richard L. Duesterhaus
 State Conservationist
 Soil Conservation Service
 U.S.D.A. Office Building
 University of Maine
 Orono, Maine 04473

Dear Mr. Duesterhaus:

I want to thank you for the opportunity to participate as a representative of the Board of Directors of the State Biologists' Association in the field trip to the Twenty-five Mile Stream Watershed Project on 16 December 1974. I commend you on your concern that all interested parties be informed and have an input to the Soil Conservation Service plans for Twenty-five Mile Stream.

I would like to express misgivings concerning the project and the December 1974 Draft Environmental Impact Statement. I have considered the E.I.S. carefully and am concerned about several implications of the project. My concern is also reflected in the concern of state biologists in the Maine Department of Environmental Protection who have pointed out the following:

1. Clearing and snagging of the 1500 foot channel would remove fish cover and consequently reduce the carrying capacity of this portion of the stream for fish.
2. The 9500 feet of channelization would have an adverse aesthetic effect on the stream and would produce essentially an artificial ditch.
3. Fish cover in the 9500 foot channel area would be reduced due to both the removal of cover and the shortening of the stream itself.
4. Siltation during the construction period would adversely affect the environment with a probable destruction of brook trout spawning areas and benthic alteration.

Mr. Richard L. Duesterhaus
11 March 1975
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5. The project would alter the characteristics of the stream affecting its ability to assimilate the output of the Unity Sewage Treatment Plant.
6. Additional cottage development will have an adverse ecological and aesthetic influence on the lake.

At its meeting on 8 March 1975, the Board of Directors of the State Biologists' Association has endorsed the following as its position on the Twenty-five Mile Stream Watershed project.

The danger of hastening and exacerbating eutrophication of the lake by additional cottage development is evident in Mr. Charles Rabeni's recent Survey of Lake Winnecook, yet this project makes available 40 acres of wildlife habitat for as many as 80 camp sites.

Changes in the hydraulic characteristics of Twenty-five Mile Stream will, in all likelihood, seriously affect the flushing characteristics of the lake. A decrease in the annual flushing of the lake may also hasten eutrophication due to a build up of nutrients.

Lake Winnecook serves as a temporary flood runoff reservoir following storms, providing a gradual release of water into Twenty-Five Mile Stream. As much, if not more, water will course through Twenty-five Mile Stream in less time following the project, yet evidence that the stream bed below the channelization area will adequately handle the storm runoff is lacking, as is assurance that the stream will not require further environmental modification to prevent downstream flooding all the way to the Seabasticook River.

We are concerned about the future of the wetland area between and around Sandy Stream and Twenty-five Mile Stream if the lake level fluctuations are reduced, since this reduction will tend to force this area into a terrestrial succession and thus eliminate a productive area for wildlife support.

Further, since the discharge characteristics of the Unity Sewage Treatment Plant are predicated on the present hydraulics of Twenty-five Mile Stream, what will happen as a result of the channelization is a matter of grave concern.

Several of the "favorable environmental effects" listed in the draft E.I.S. are of questionable pertinence to the environment, even if favorable in some other sense. "Increased employment opportunities during construction and maintenance of the structures" can hardly be construed as a favorable environmental effect. Nor can "increased trafficability, access, and safety on currently flood-prone roads" and an "increased standard of living for low-income farmers" be a significant favorable effect on the environment. Indeed, "increased public access" to Lake Winnecook and an "improved recreational access to the construction area along Twenty-five Mile Stream" will in all probability have an adverse effect on the environment.

Mr. Richard L. Duesterhaus

11 March 1975

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Your stated "adverse environmental effects" also generate some confusion. For instance, 800 acres of wetland will be affected by the project - how? On the one hand, you list the removal of wildlife cover upstream from Prairie Road as an adverse effect and on the other hand, you list the improvement of wildlife access along the channel as a favorable environmental effect. What is really going to occur here is a change in the wildlife habitat that may benefit some species and will certainly be detrimental to other species.

The Environmental Impact Statement seems to be used here primarily as a justification or rationalization of the project since it is largely devoted to proclaiming the benefits to be derived from the project rather than to an analysis of environmental impact. The impact statement credits the project with providing towns with the basic information necessary for shoreland zoning (page 32, December 1974 draft), yet Unity will vote on a shoreland zoning ordinance on 15 March 1975 that has already been prepared without benefit of such data. Indeed, this plan was developed without even consulting the Unity Planning Board within the past two years.

Errors in any document reduce confidence in the document as a whole. Several errors in the E.I.S. are readily apparent. Dr. Jan F. Sassaman, Associate Professor of Environmental Science, Unity Planning Board Member, and State Biologists' Association Board Member attended the 16 December 1974 tour of the watershed as the SBA representative as indicated by Dr. William Gilbert in his letter to you on 6 December 1974 (page 47). Dr. J. Mudge is a professor at the University of Maine at Farmington, not Colby College (page 47). Mr. Charles Rabeni, while a graduate student at the University of Maine, is an Assistant Professor of Environmental Science at Unity College, his work on Lake Winnecook was part of a grant to Unity College, and much of his water quality monitoring work is conducted in the laboratory at Unity College. Taken individually, these are minor errors, but collectively, they reflect on the care taken with the document. We hope the rest of the E.I.S. is more accurate. However, on the face of it, the December 1974 Draft E.I.S., in the judgement of thoughtful qualified biologists, is totally inadequate.

The ecological outcome of large scale environmental manipulation such as you propose cannot be predicted with any degree of confidence. Too often, in any tradeoff between the environment and economics, the environment is the loser. The critics of environmental manipulation by stream channelization are many and vocal. As an example, we quote Dr. I.N. Gabrielson's letter of 3 October 1969 to S.C.S. Administrator Kenneth E. Grant (Stream Channelization, Fifth Report, House Committee on Government Operation):

"From study and review of many of the small watershed plans which have caused controversy since 1961, we believe a major shortcoming of the program is in failure to communicate with conservation interests until after local watershed sponsors had become committed and politically active in supporting a plan of development containing features unacceptable to conservationists." (P. 51)

Mr. Richard L. Duesterhaus

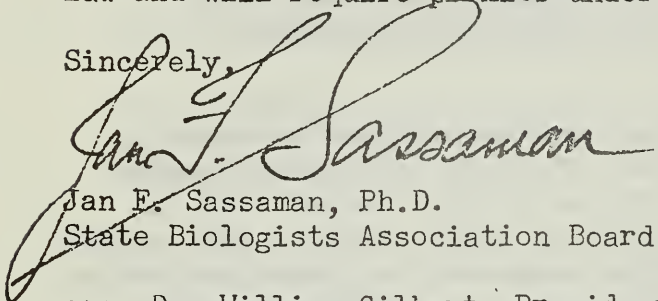
11 March 1975

Page -4-

Perhaps with the Twenty-five Mile Stream project the SCS has become committed to support the project before thoroughly evaluating its environmental consequences.

Finally, we remind you that this project comes under the Great Ponds Act (DEP), the "Bull Dozer Law", (Department of Fish and Game), and the E.P.A. site selection law and will require permits under all three.

Sincerely,



Jan F. Sassaman, Ph.D.

State Biologists Association Board of Directors

cc: Dr. William Gilbert, President, S.B.A.
Dr. Allan Karstetter, President, Unity College
U.S. Department of Transportation
Mr. Andrew Reed, Chairman, Unity Planning Board
Maine Fish and Game Association
Maine Association of Conservation Commissions
Maine Natural Resources Council
Maine Congress of Lakes Association
Governor of Maine
Maine Department of Inland Fisheries and Game
Maine Audubon Society
North Kennebec Regional Planning Commission
Maine Department of Environmental Protection
Kennebec Valley Conservation Association

APPENDIX D

SPECIES LIST

SPECIES MENTIONED IN NARRATIVE*TWENTY-FIVE MILE STREAM WATERSHEDINVERTEBRATES

Caddisfly - or. Trichoptera
Mayfly - or. Plectophora
Scuds - or. Amphipoda, Gammarus spp.
Snails - cl. Gastropoda
Stonefly - or. Plecoptera
Worms - ph. Annelida

BIRDS

American goldeneye - *Glaucionetta clangula americana*
Black duck - *Anas rubripes*
Bluewing teal - *Anas discors*
Greenwing teal - *Anas crecca carolinensis*
Ringnecked duck - *Aythya collaris*
Ruffed grouse - *Bonasa umbellus*
Woodcock - *Philohela minor*
Wood duck - *Aix sponsa*

FISH

American smelt - *Osmerus mordax*
Brook trout - *Savelinus fontinalis*
Brown bullhead - *Ictalurus nebulosus*
Chain pickerel - *Esox niger*
Fall fish - *Semotilus corporalis*
Golden shiner - *Notemigonus crysoleucas*
Land locked salmon - *Salmo salar*
Large mouth bass - *Micropterus salmoides*
Small mouth bass - *Micropterus dolomieu*
White perch - *Roccus americanus*
White sucker - *Catostomus commersoni*
Yellow perch - *Perca flavescens*

MAMMALS

Beaver - *Castor canadensis*
Fisher - *Martes pennanti*
Mink - *Mustela vison*
Muskrat - *Ondatra zibethica*
Otter - *Lutra canadensis*
Raccoon - *Procyon lotor*
Red fox - *Vulpes fulva*
Skunk - *Mephitis mephitis*
Snowshoe hare - *Lepus americanus*
Whitetail deer - *Odocoileus virginiana*

SPECIES MENTIONED IN NARRATIVE*
 TWENTY-FIVE MILE STREAM WATERSHED
 Page 2

TREES

American beech - *Fagus grandifolia*
 American elm - *Elmus americana*
 Apple - *Malus* spp.
 Balsam fir - *Abies balsamea*
 Bigtooth aspen - *Populus grandidentata*
 Black ash - *Fraxinus nigra*
 Brown ash - *Fraxinus nigra*
 Gray birch - *Betula populifolia*
 Hemlock - *Tsuga canadensis*
 Northern white cedar - *Thuja occidentalis*
 Quaking aspen - *Populus tremuloides*
 Red maple - *Acer rubrum*
 Red oak - *Quercus rubra*
 Silver maple - *Acer saccharinum*
 White birch - *Betula papyrifera*
 White spruce - *Picea glauca*

CROPS

Alfalfa - *Medicago sativa*
 Corn - *Zea mays*
 Potato - *Solanum tuberosum*
 Timothy - *Phleum pratense*

OTHER PLANTS

Aster - *Chrysopsis* spp.
 Beggar tick - *Bidens* spp.
 Blackberry - *Rubus allegheniensis*
 Bluejoint - *Calamagrostis canadensis*
 Bulrush - *Juncus* spp.
 Buttonbush - *Cephalanthus occidentalis*
 Cattail - *Typha latifolia*
 False hellebore - *Veratrum* spp.
 Goldenrod - *Solidago* spp.
 Leather leaf - *Chamaedaphne calyculata*
 Raspberry - *Rubus idaeus*
 Red osier dogwood - *Cornus stolonifera*
 Silky cornel dogwood - *Cornus amomum*
 Sweetgale - *Myrica gale*
 Viburnum - *Viburnum* spp.

* This list does not represent an in-depth inventory of species present. It is a listing of the animals and plants mentioned in the work plan and EIS narratives.

E

APPENDIX E

ELECTROFISHING SURVEY

AN ELECTROFISHING SURVEY OF UPPER TWENTYFIVE MILE STREAM,
UNITY(WALDO COUNTY), MAINE

FINAL REPORT

Submitted to: U. S. Department of Agriculture
Soil Conservation Service

Prepared by: George T. McCabe Jr.
Maine Cooperative Fishery Research Unit

This report summarizes electrofishing data collected on the fish populations in Twentyfive Mile Stream between the Prarie Road bridge and a point approximately 4.7 kilometers (stream distance) downstream. We also sampled fish populations in a small tributary which crosses Route 139; the sample area in the tributary extended from its mouth to a point 220 m upstream. Electrofishing was done from November 4 to November 7, 1975.

Both alternating current (AC) and direct current (DC) were used. Boat electrofishing gear (AC) was used in sections 6, 7, 8, 9 and 10 (see attached map), whereas in the remaining sections stream electrofishing gear (DC) was employed. Approximately 2.7 km (57.5%) of the study section was sampled.

All fishes captured were identified to species. Length and weight were measured on all fishes except cyprinids. The relative abundance of fishes (excluding cyprinids) was expressed as catch per hour of electrofishing (Table 1). No salmonid species were seen during shocking operations. Most of the game fishes were small (Table 2). Distribution of species by section is summarized in Table 3.

Periodic poor visibility and high water helped contribute to the small number of fishes collected. Ideally the stream should be electrofished during the summer, when water levels are considerably lower. Low water levels would permit the use of stream electrofishing gear in a large portion of the stream. Because of higher water levels in November we were forced to employ boat electrofishing gear. No sampling was done between the mouth of the small tributary which crosses Route 139 and the downstream end point, except for one 75 m section (see attached SCS map). The water level was high enough

to permit boat electrofishing in the omitted segment, but there were no boat launching sites. In any future studies an attempt should be made to sample fish populations in this area.

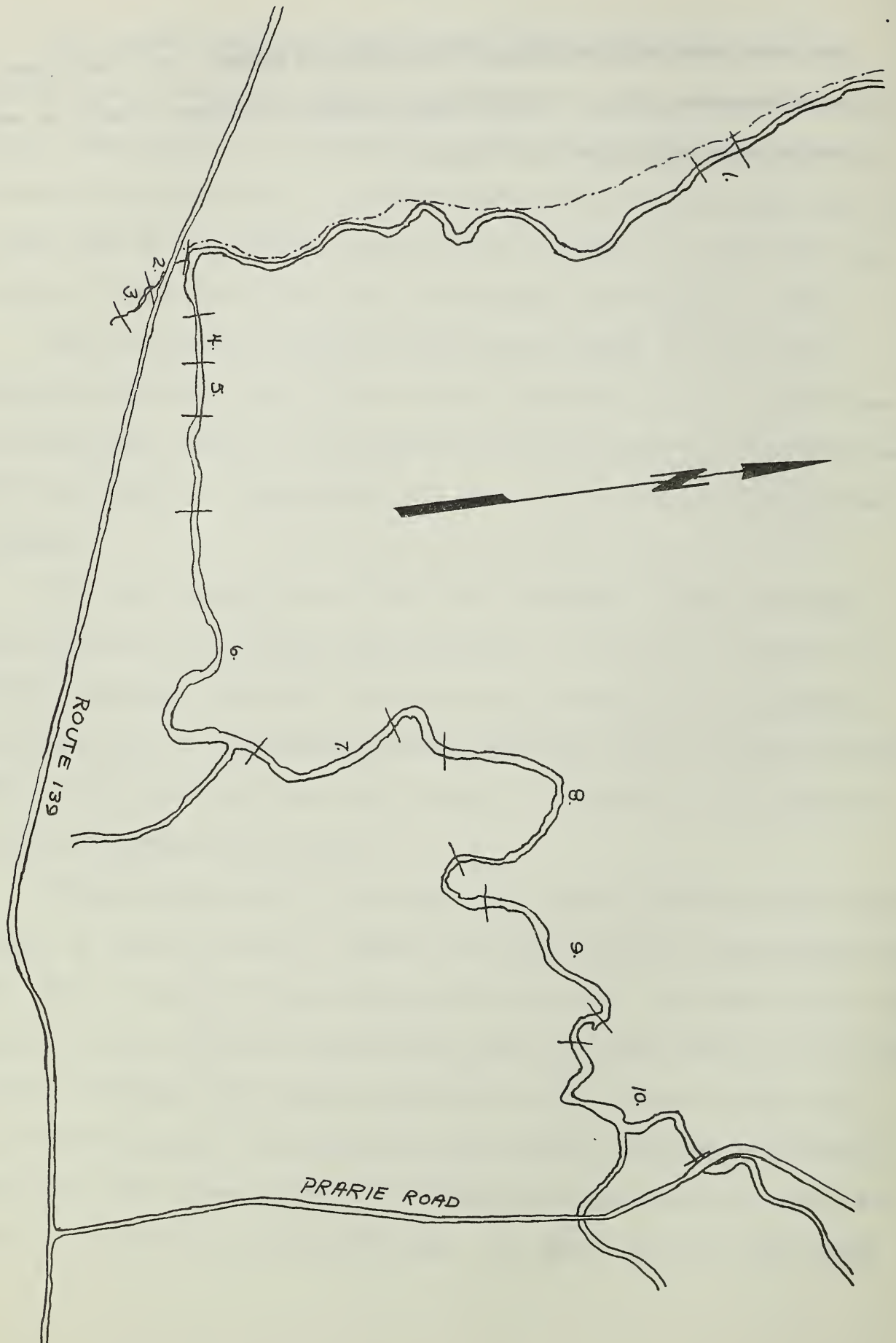


Table 1.--Relative abundance of fishes*(expressed as catch per hour of sampling) captured with electrofishing gear in Twentyfive Mile Stream and a small tributary from November 4 to November 7, 1975.

Species	Total Number	Catch per hour
American eel <u>Anguilla rostrata</u>	12	1.7
Chain pickerel <u>Esox niger</u>	2	0.3
White sucker <u>Catostomus commersoni</u>	168	24.1
Brown bullhead <u>Ictalurus nebulosus</u>	7	1.0
Burbot <u>Lota lota</u>	8	1.1
Redbreast sunfish <u>Lepomis auritus</u>	5	0.7
Pumpkinseed <u>Lepomis gibbosus</u>	19	2.7
Smallmouth bass <u>Micropterus dolomieu</u>	11	1.6
Largemouth bass <u>Micropterus salmoides</u>	16	2.3
Yellow perch <u>Perca flavescens</u>	15	2.2

*Cyprinid species noted present but not enumerated:

Golden shiner, Notemigonus crysoleucas
Common shiner, Notropis cornutus

Blacknose dace, Rhinichthys atratulus

Creek chub, Semotilus atromaculatus

Fallfish, Semotilus corporalis

Table 2.--Length frequency distributions of the fish species (excluding cyprinids) captured with electrofishing gear in Twentyfive Mile Stream and a small tributary (which crosses Route 139) from November 4 to November 7, 1975.

		Size interval (mm)													
		1-50	51-100	101-150	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	551-600	601-650	
American eel	Number			1			2	1	1	1	3	1	1	1	
	Mean			192			287.5	330	366	440	477.3	515	551	604	
	S.E.			-			±12.5	-	-	-	±11.7	-	-	-	
Chain pickerel															
Number		1													
Mean		140													
S.E.		-													
White sucker															
Number		111	42	11		2				1	1				
Mean		-	128.7	173		223.5				433	451				
S.E.		-	±1.9	±4.6		±11.5				-	-				
Brown bullhead															
Number			5	2											
Mean			132.8	162.5											
S.E.			±3.9	±7.5											
Burbot															
Number			6	1			1								
Mean			114.5	161			265								
S.E.			±4.5	-			-								

E-6

Table 2.--Continued

		Size interval (mm)												
		1-50	51-100	101-150	151-200	201-250	251-300	301-350	351-400	401-450	451-500	501-550	551-600	601-650
Redbreast sunfish														
Number	1		1	3										
Mean	41		71	110										
S.E.	-		-	±3.5										
Pumpkinseed														
Number	13		3	3										
Mean	43.7		87	111										
S.E.	±0.9		±6.4	±2.5										
Smallmouth bass														
Number			7	3			1							
Mean			77.4	117.3			292							
S.E.			±3.6	±9.0			-							
Largemouth bass														
Number			13	2	1									
Mean			71.4	114	155									
S.E.			±2.3	±2	-									
Yellow perch														
Number			9	4	2									
Mean			74.4	117.8	176									
S.E.			±2.3	±5.9	±6									

E-7

Total number of fish: American eel 12, Chain pickerel 2, White sucker 168, Brown bullhead 7, Burbot 8, Redbreast sunfish 5, Pumpkinseed 19, Smallmouth bass 11, Largemouth bass 16 and Yellow perch 15.

Table 3.--Spatial distribution of fish species (excluding cyprinids) captured by electrofishing in Twentyfive Mile Stream, November 4-7, 1975.

Species	1	2&3*	4&5	6	7	8	9	10
American eel	1	0	0	6	2	2	0	1
Chain pickerel	0	2	0	0	0	0	0	0
White sucker	12	13	16	17	4	52	38	16
Brown bullhead	0	0	0	0	3	2	0	2
Burbot	1	0	1	0	1	3	0	2
Redbreast sunfish	0	0	0	1	1	1	0	2
Pumpkinseed	0	0	0	4	0	0	6	9
Smallmouth bass	1	0	3	3	1	3	0	0
Largemouth bass	0	0	0	4	6	2	2	2
Yellow perch	0	0	1	2	0	2	3	7

*Tributary stream

APPENDIX F

AQUATIC VEGETATION STUDY

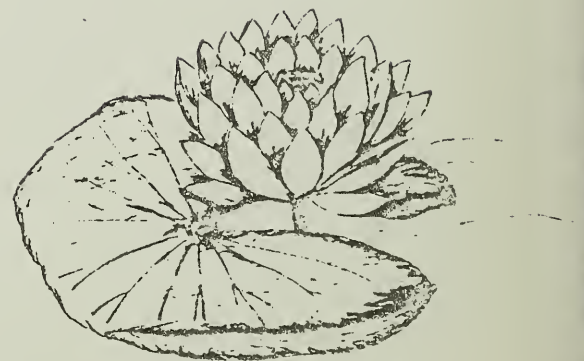
ENVIRONMENTAL STUDIES

OF

Twenty-Five Mile Stream

1974-1975

PART C
AQUATIC VEGETATION



Environmental Studies Of Twenty-Five Mile Stream

Waldo County, Maine

1974-1975

Part C. Aquatic Vegetation, with information on bottom type
and riparian vegetation.

Prepared for:

Watershed Planning Staff
Soil Conservation Service
United States Department of Agriculture
U.S.D.A. Building, University of Maine
Orono, Maine 04473

By:

Charles F. Rabeni

Contract No.

209-ME-SCS-75

ACKNOWLEDGEMENTS

I am grateful to David Knupp, Associate Professor of Wildlife, Unity College, for field and laboratory assistance and to Dr. Charles Richards, Professor of Botany, University of Maine, for verifying many of the plant identifications.

Abstract

A study of the aquatic macrophytes of Twenty-five Mile Stream, Waldo County, Maine, was conducted during the summer of 1975. Its purpose was to provide information on the ecology of the existing macrophytes in order to assess the impact of the proposed construction project and to provide baseline data which can be compared with a post-construction study. An extensive survey covering approximately 13,000 feet of stream was made where the distribution and abundance of all species were recorded. Species abundance was correlated with certain physical factors. Significant correlations showed that the total plant abundance increased when the stream became more shallow, with higher current velocity, and a more rubbly bottom. Correlations between environmental factors and individual species were significant in only a few cases. Longitudinal variations in some species were noted. An intensive analysis was made on five representative stream sections. Estimates of standing crop numbers and biomass were made. An appraisal was given as to the effect of the proposed project on the macrophyte community.

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INTRODUCTION

The use of higher aquatic plants (macrophytes) in water quality investigations has been seriously neglected (Webber 1973). This is surprising because physical changes in water bodies can have dramatic effects on macrophyte growth. Current velocity, water depth, substratum types, and vulnerability to spates are the major physical factors limiting macrophytes (Hynes 1972), and all of these factors are usually affected in projects involving physical alteration of a stream or water discharge regulation structures.

Widening and deepening of a stream channel will change existing current velocities while dropbox structures will moderate overall flows and dampen the effect of spates. Current regime changes will affect substratum type. A faster current will make the stream bottom more rubbly while a reduction in current will cause deposition and siltation. Widening of the stream will also alter the existing water depths. These physical changes are often reflected in changes in the aquatic plant community and the riparian vegetation.

This study of plant communities of Twenty-five Mile Stream can be used with any future investigations that may be conducted in conjunction with the proposed Twenty-five Mile Stream project. This study can also be used in predictive models that may be necessary to the project for evaluating possible changes in the flora and fauna of the stream.

METHODS

The field study was conducted in two phases; an extensive semi-quantitative analysis and an intensive quantitative analysis. Initial field work was conducted the week of July 7, 1975 with follow-up work done on August 23, 1975.

Extensive Survey

The extensive survey determined the general distribution and abundance of plants in the study area. The stream was traversed by canoe from the outlet of Kanokolus Bog to approximately 2000 feet beyond the proposed project. Water depth and sky conditions dictated the method of observing the aquatic vegetation. The plants were plainly visible in shallow water or under clear skies. A diver using snorkel or S.C.U.B.A. made observations in deep water or under cloudy skies.

The stream was divided into several sections (Figure 1). Each section consisted of a more or less homogeneous plant association, water depth, and bottom type. When one of these factors changed significantly a new stream section was delineated.

In each stream section the following data was recorded:

Mean Depth:

Mean Width:

Mean Current Velocity: A Weather Measurer Pigmy current meter was held three inches under the surface to measure velocity.

Substratum Type: A bottom classification similar to the one recommended by the United States Environmental Protection Agency (Webber 1973) was used (Table 2). Where more than one bottom type was present they were recorded in order of decreasing abundance. For example, R-S indicates mostly rubble with lesser amounts of sand.

Aquatic Vegetation: In the extensive survey percent bottom cover of each species and the percent of the total bottom covered by all species were recorded by stream section. The growth form of each species was also recorded.

Riparian Vegetation: Three layers of riparian vegetation were recognized on each streambank. Vegetation over 20 feet tall was considered overstory, woody plants 2 to 20 feet tall were considered shrubs, and non-woody plants regardless of height were classed as herbaceous. Species within the overstory were listed in a manner similar to the aquatic vegetation, however only the most abundant species were recorded. Within the shrub layer plants that would eventually grow into the overstory were listed as reproduction and those plants that are always considered shrubs were listed as mature. No attempt was made to list herbaceous plants by species but they were divided into the general growth forms of grasses, forbes, and ferns.

Benthic Algae: A general observation for bottom algae growth was made and was reported as being present, i.e., conspicuous, or as being absent.

Stream Shade: Estimates were made on whether the riparian vegetation would shade more or less than twenty percent of the stream from a vertical sun.

Intensive Survey

The intensive survey consisted of an analysis of five representative stream sections (See Figure 1 for exact locations). In each section a "midline" perpendicular to the stream was established and ten equally spaced 0.25 m^2 quadrats, five above and five below the midline, were denuded of all vegetation. Plants were placed in plastic bags and later were sorted to species, counted, dried, the roots removed and weighed. This data was used to estimate standing crop and biomass.

Fassett (1957) and Britton and Brown (1970) were the primary taxonomic references and where differences in nomenclature of aquatic plants occurred, Fassett was followed.

RESULTS AND DISCUSSION

Twenty-five Mile Stream was divided into twenty-six sections based on vegetation type, current velocity, depth and bottom type (Figure 1). Each section is considered a homogeneous ecological unit and is the basis for statistical analysis.

Extensive Survey

A species list of plants that were collected is shown in Table 1 and data obtained on each stream section is presented in Table 3. Aquatic plants were numerous in both species and numbers throughout the length of the study area. Mean percentage cover for all sections was 60 percent and mean number of species in each section was 5.6.

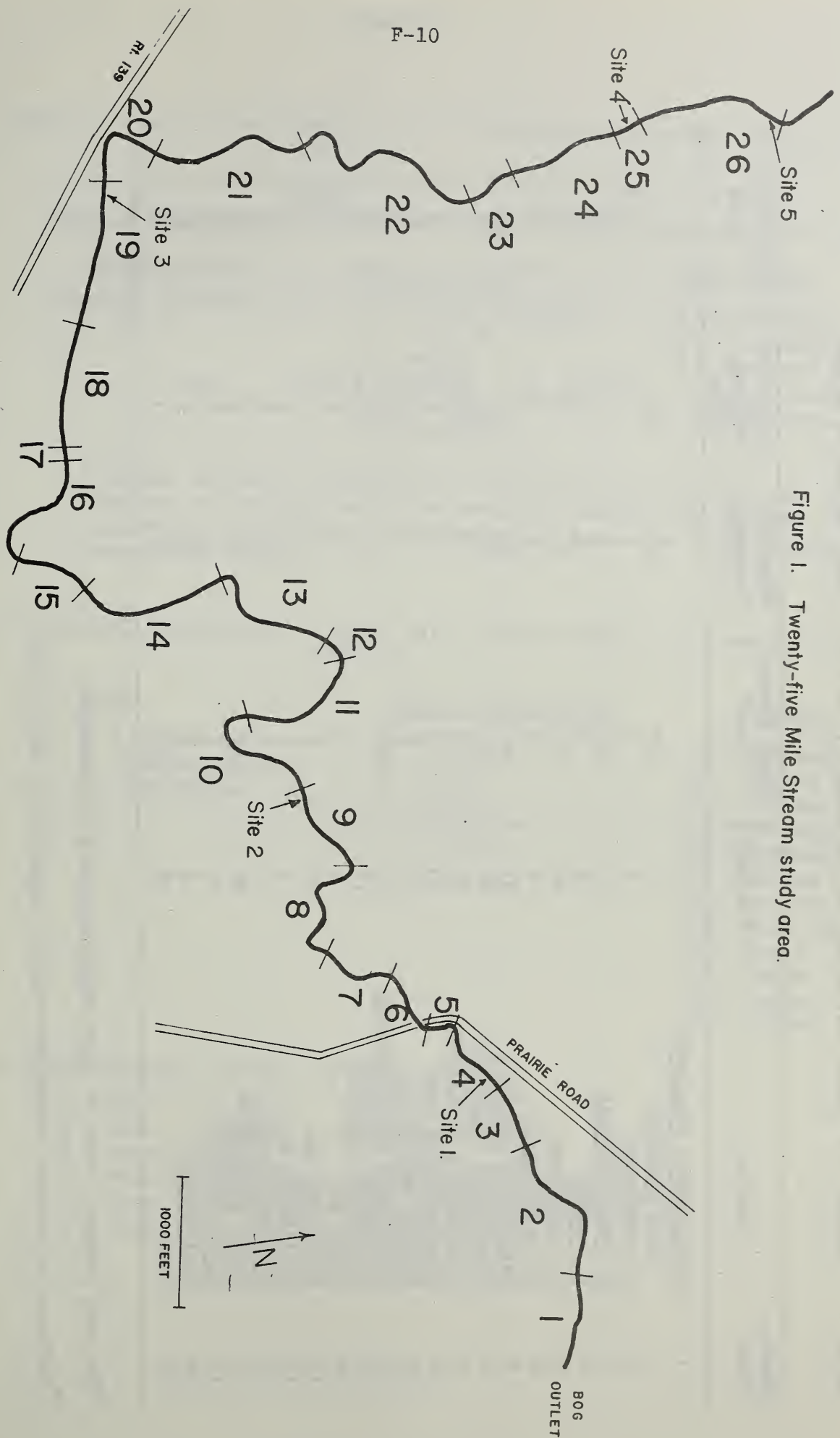


Figure 1. Twenty-five Mile Stream study area.

Table 1. A summary of plants collected in the Twenty-five Mile Stream extensive survey.

Species Code	Species	Frequency	Mean Percent Cover*	Relative Frequency	Relative Percent Cover	Importance Value
1	<u>Potamogeton gramineus</u>	53	47	10	14	11
	var. <u>maximus</u>	4	5	1	1.5	1.2
2	<u>P. gramineus</u>	15	50	3	1.5	9
3	<u>P. zosteriformis</u>	4	5	1	1.5	1
4	<u>P. natans</u>	58	25	11	8	9
5	<u>P. epihydrus</u>	4	5	1	1.5	1
6	<u>P. perfoliatus</u>	81	44	16	13	14
7	<u>Sagittaria subulata</u>	69	31	14	10	12
8	<u>Sparganium fluctuans</u>	35	16	7	5	6
9	<u>Vallisneria americana</u>	23	5	4	1.5	2
10	<u>Ceratophyllum</u> spp.	19	5	4	1.5	3
11	<u>Elodea canadensis</u>	35	28	7	10	8
12	<u>Podostemum ceratophyllum</u>	11	5	2	1.5	2
13	<u>Pontederia cordata</u>	4	5	1	1.5	1.2
14	<u>Typha</u> sp.	4	5	1	1.5	1.2
15	<u>Polygonum</u> sp.	4	4	1	1	1
16	<u>Fontinalis</u> sp.	4	4	1	1	1
17	<u>Nymphaea odorata</u>	38	17	7	6	6
18	<u>Najas flexilis</u> **	4	5	1	1.5	1
19	<u>Sagittaria</u> sp.	8	5	2	1.5	2
20	<u>Sagittaria</u>	15	10	3	3	3
21	Grass					

* The mean percent cover of those sections where it occurred.

** Reflects mid-August abundance--was not apparent in early July.

Table 2. Key to the results of the extensive plant survey (Table 3).

1. Aquatic Vegetation: A three part code was used in column 6 of Table 3.

<u>Species Code</u> (Listed in Table 1)	<u>Percent Cover*</u>	<u>Growth Form</u>
	P = present but not over 5%	S = Submerged
	A = 6-25%	F = Floating leaves
	B = 26-50%	E = Emergent with only roots in the water
	C = 51-75%	
	D = 76-100%	

* Because of plant layering and interspersed growth, the sum of the species percentages was often over 100 percent and the sum of the individual species did not necessarily equal the total vegetative percentage cover.

2. Riparian Vegetation: A three part code was used in columns 9-10 of Table 3.

<u>Type</u>	<u>Percent Total Cover</u>	<u>Species</u>
O = Overstory	E = 0-5	22 = Red maple
S = Mature shrub	A = 6-25	23 = Silver maple
H = Herbaceous	B = 26-50	24 = Red oak
	C = 51-75	25 = Ash spp.
	D = 76-100	26 = Basswood
		27 = Balsam fir
		28 = Hemlock
		29 = Birch spp.
		30 = Ferns
		31 = Grass
		32 = Forbes
		33 = Shrubs

3. Bottom Types: (Column 5 of Table 3)

C = Clay
M = Muck - (organic + inorganic)
S = Sand-gravel
R = Rubble - primarily orange-grapefruit sized rocks
W = Large rubble - primarily watermelon sized rocks
L = Ledge

Table 2. Continued.

4. Benthic Algae: (Column 7 of Table 3)

O = Not noticeable to the naked eye

P = Present and noticeable varied from 5-25 percent
bottom cover5. Shade from Riparian Vegetation: (Column 8 of Table 3)

-20 = Less than 20 percent of the stream shaded

+20 = More than 20 percent of the stream shaded

Table 3. Results of the extensive survey for each stream section.

Stream Section	Water Velocity (cm/sec)	Depth (ft)	Mean Width (ft)	Bottom Type	Aquatic Vegetation Percent Cover	Benthic Algae	Shade	Riparian Left Bank	Riparian Right Bank
1	14	40	40	M	3-C-S 5-A-S(F) 11-P-B 10-P-S 15-P-E 9-P-S Total = C	P	-20	0-E 5-B-33 H-B-32	0-E 5-A-33 H-B-30
2	10	96	45	M	7-P-S 1-P-S 14-O-E 10-P-S 13-P-E 9-A-S 3-B-S 5-P-S Total = B	P	+20	0-23,25 S-B-33 H-D-30 H-A-31	0-23,25 S-B-33 H-D-30 H-A-31
3	14	36	45	S-R	7-C-S 3-A-S 9-A-S Total = C	0	+20	0-23,25 S-B-33 H-C-30 H-A-31	0-23,25 S-B-33 H-C-30 H-A-31
4	<3	120	40	M	10-P-S 7-A-S 9-A-S Total = A			0-23 S-A-33 H-C-30 H-A-8	0-23,25 S-B-33 H-D-30 H-A-8
5	15	48	50	R-S	3-B-S 7-B-S 5-A-S 9-A-S Total = D	0	+20	0-23,25 S-D-33 H-C-30	0-23,25 S-D-33 H-C-30

Table 3. Continued.

Stream Section	Water Velocity (cm/sec)	Depth (cm)	Mean Width (cm)	Bottom Type	Aquatic Vegetation Percent Cover	Benthic Algae	Shade	Riparian Left Bank	Riparian Right Bank
6	20	32	45	S-R	8-A-S 1-D-S 9-A-S Total = D	P	+20	0-25,22,23 S-B-33 H-D-30	0-25,22,23 S-B-33 H-D-30
7	9	60	30	S	10-P-S 11-P-S 7-A-S 19-P-F 7-P-F 8-P-S 9-D-S Total = A	P	-20	0-25,22,23 S-A-33 H-A-31 H-C-30	Recently clear cut
8	9	60	30	S-R	7-B-S 1-A-S 8-P-S 9-P-S 18-A-S Total = B	P	-20	0-22,23,25 S-B-33 H-C-30	0-25,22,23 S-B-33 S-A-34 H-C-30 H-A-31
9	20	30	40	R-S	1-D-S 8-B-S Total = D	0	-20	0-22,25,24 S-C-33 H-A-31 H-A-30 H-A-32	0-22,26 S-B-33 H-B-31 H-B-30
10	11	28	35	R-S	1-C-S 8-D-S 7-B-S 9-P-S Total = D	0	+20	0-24,25,22 S-D-33 H-D-30	0-24,26,22 S-D-33 H-D-30

Table 3. Continued.

Stream Section	Water Velocity (cm/sec)	Mean Depth (m)	Mean Width (m)	Bottom Type	Aquatic Vegetation Percent Cover	Benthic Algae	Shade	Riparian Left Bank	Riparian Right Bank
11	23	28	45	R-S	1-D-S 8-A-S 7-B 5-P-S Total = D	0	+20	0-22,24,25 S-B-33 H-B-30	0-22,24,29 S-B-33 H-B-30
12	40	25	30	R-W-S	12-B-B 8-B-S 7-B-S Total = D	0	-20	0-22 S-D-33 H-B-30	0-22-25 S-D-33 H-C-30 H-A-31
13	21	28	35	R-W-S	1-B-S 5-B-S 7-D-S 12-P-B 18-P-S Total = D	0	+20	0-22,24, 25,27 S-C-33 S-A-34 H-C-30	0-25,22, 26,27 S-D-33 H-D-30
14	8	60	55	S	7-A-S 8-P-S 5-P-S 21-P-E 10-P-S 18-A-S Total = B	0	+20	0-22,27,28 S-B-33 S-B-34 H-C-30	0-22,25,26 S-C-33 S-A-34 H-A-30
15	variable	variable	40	S-R	8-D-S 5-B-S 7-B-S 11-P-S 10-P-S 20-P-S 21-P-S 13-P-E 4-P-F 18-A-S Total = D	P	+20	Same as #14	Same as #14

Table 3. Continued.

Stream Section	Water Velocity (cm/sec)	Depth (ft)	Mean Width (ft)	Bottom Type	Aquatic Vegetation Percent Cover	Benthic Algae	Shade	Riparian Left Bank	Riparian Right Bank
16	3	28	35	R-WS	1-B-S 5-B-S 7-D-S 12-P-B 18-P-S Total = D	P	+20	0-29,22 S-C-33 H-B-32 H-B-30 H-A-31	0-E S-D-33 S-A-34 H-E
17	17	30	50	R-S	1-P-S 8-A-S 12-P-B 7-A-S 5-A-S 18-P-S Total = B	P	+20	Same as #16	0-22 S-C-33 S-A-34 H-B-30 H-B-31 H-B-32
18	40	25	40	LWR	12-C-B 8-A-S 5-A-S 21-A-S Total = D	0	+20	Same as #16	Same as #17
19	12	20	65	S-R	8-A-S 7-B-S 18-P-S 5-P-S 1-P-S Total = C	0	+20		
20	--	30	--	C	None	P	+20	0-25,24,29 S-A-33 H-B-30	0-25,24,29 S-A-33 H-B-30

Table 3. Continued.

Stream Section	Water Velocity (cm/sec)	Depth (cm)	Mean Width (m)	Bottom Type	Aquatic Vegetation Percent Cover	Benthic Algae	Shade	Riparian Left Bank	Riparian Right Bank
21	10	20	35	S-LG	8-A-S 7-A-S 5-P-S 12-P-S 11-P-S 18-A-S Total = A	0	-20	0-25,24,26 S-A-33 H-C-30 H-C-31	0-25,24,22 S-B-33 H-B-30 H-A-31
22	15	48	40	C-S	8-A-S 7-A-S 5-P-S 12-P-S 11-P-S 18-A-S Total = A	0	-20	Same as #21	Same as #21
23	28	25	40	S-R-L	1-D-S 8-A-S 7-A-S 12-P-B 13-P-E 21-P-E Total = D	0	-20	Same as #21	Same as #21
24	11	34	55	S-R	5-C-S 8-A-S 7-C-S 18-B-S 1-P-S Total = C	P	-20	0-25,26 S-B-33 S-A-31 H-C-30 H-A-32	0-25,26,22 S-B-33 H-A-30 H-A-31 H-A-32

Table 3. Continued.

Stream Section	Water Velocity (cm/sec)	Depth (ft)	Mean Width (ft)	Bottom Type	Aquatic Vegetation Percent Cover	Benthic Algae	Shade	Riparian Left Bank	Riparian Right Bank
25	28	25	45	W-R-L	12-D-B 8-A-S 1-A-S 5-A-S 18-A-S Total = D	0	-20	Same as #24	Same as #24
26	18	35	55	R-S	7-C-S 8-A-S 1-A-S 20-P-S Total = 25	0	-20	0-22,25,29 S-B-33 H-C-30 H-A-31	0-22,25 S-A-33 H-D-30

For the purpose of analysis it is convenient to group the plants into ecological groups.

Group I. Emergent Plants: Members of this group possessed submerged roots but had most of their photosynthesizing structures protruding above the water level. Pickerelweed (Pontederia cordata), cattail (Typha sp.), smartweed (Polygonium spp.), and several species of arrowhead (Sagittaria spp.), occurred only on the stream margins and usually in quiet backwaters where the current was much reduced. None of these plants had a frequency of occurrence of over 11 percent nor did they ever have a percent cover greater than five percent.

Group II. Rooted Plants With Floating Leaves: This group included the white water lily (Nymphaea odorata) and a species of pondweed (Potamogeton natans). These plants require still water for growth and were found only in quiet side-bays of the stream. Both species rated less than 5 five percent in frequency and cover.

Group III. Submergent Plants with most Photosynthesizing Structures under Water: The majority of plants in the stream belonged to this group. In very shallow riffle areas riverweed (Podostemum ceratophyllum) and the river moss (Fontinalis sp.) occurred. These two species grow close to the substratum and easily attach themselves to large rocks in the riffle areas. Riverweed was the most abundant of the two.

In deeper waters of the main channel several abundant species were present. The pondweeds (Potamogeton spp.) were particularly well represented

with four species and two varieties of one species. The two dominant Potamogetons were P. gramineus and P. epihydrus. Both occurred in over half the stream sections and were evenly distributed from the Prairie Road Bridge to the end of the study area. Above the bridge P. zosteriformis was the dominant pondweed. Other pondweeds showed scattered distribution.

Three grass like plants of this group are similar and are considered here together. The most abundant plants in the stream was an arrowhead, Sagittaria subulata. It occurred in 81 percent of all stream sections with a mean cover of 44 percent and it was equally distributed along the length of the study area. Wild celery (Vallisneria americana) and burreed (Sparganium fluctuans) are quite similar morphologically, but showed complimentary distribution. Vallisneria was most abundant in the first five stream sections. Both species occurred in the next five sections while Sparganium dominated thereafter.

Coontail (Ceratophyllum spp.), water milfoil (Myriophyllum spp.), and common elodea (Elodea canadensis) had frequencies below 25 percent and a mean percent cover of five percent. Elodea tended to be found in shallow side bays while the other two species were found in deep, slow moving water.

An indication of each species standing in the community was determined by calculating its importance value as: $\text{Relative frequency} + \text{Relative Density} / 2$. By this criterion the dominant species were Sagittaria subulata, Sparganium fluctuans, and three species of Potamogeton (Table 1).

Statistical Analysis

Correlation coefficients were calculated between environmental parameters and plant growths to determine which factors influenced the abundance and distribution of aquatic vegetation.

Analysis was first carried out between environmental factors and the entire plant community (Table 4). The results of the Pearson's Product Moment Correlation coefficient show significant correlations between total percent cover (i.e., the sum of each species per section) and current velocity, water depth, and substratum type. A clear relationship existed where the plant abundance increased when water velocity increased, depth decreased and the substratum became more rubbly. This analysis is instructive but does not imply a causal relationship. These three environmental factors are intimately interdependent so it cannot be determined which is ecologically most important.

There were no significant correlations between any of the measured environmental parameters and the total number of species in each stream section.

The effects of current, depth and substratum were more obscure when correlated against some of the more common species. The only significant correlation between water depth and abundance was wild celery (Vallisneria americana). The only other species to show positive correlations was riverweed, (Podostomum ceratophyllum). This species is restricted to rapids which normally possess large substratum sizes.

Plant abundance was correlated with the distance from the lake outlet to investigate species changes along the length of the stream. The previously mentioned separation of wild celery in the upper reaches and burreed in the lower sections is shown here to be statistically significant. Wild celery was also significantly correlated with depth, so it may be that the wild celery dominated in deeper waters while burreed better tolerated more shallow conditions.

Table 4. Results of correlation analysis between aquatic plants and environmental parameters. Significant correlations at the 95 percent level are indicated by an asterisk.

	Current Velocity *	Depth *	Substratum Type *	Distance from Lake Outlet
Total plant cover	.683	-.526	.591	-.022
Number of species	-.299	.215	.105	---
<u>Potamogeton gramineus</u> var. <u>maximus</u>	.187	-.312	.301	-.011
<u>P. epihydrus</u>	.071	-.213	.261	.252 *
<u>Sagittaria subulata</u>	-.269	-.256	.231	.473
<u>Sparganium fluctuans</u>	.319	-.407	.367	.178
<u>Vallisneria americana</u>	-.279	.580 *	-.237	-.712 *
<u>Podostemum ceratophyllum</u>	.690 *	-.270	.530 *	.331

The distributions noted for three species of Potamogeton were only shown to be statistically significant with the P. zosteriformis. It grew only in the deeper, slower moving waters above Prairie Road.

Species Distribution

Twenty-five Mile Stream is extremely well endowed with aquatic plant growths, both in species and numbers. The most common plant, Sagittaria subulata has been reported only once before from Maine, and never from Waldo County. The remaining species are considered common to Maine, but very little research has been conducted on environmental requirements of stream dwelling plants so no comparisons with the present study were possible.

Seasonal Distribution

The survey was conducted primarily in early July while most of the plant growths were at a maximum. A second survey was made in mid-August. By this time many of the previously abundant plants were dying off while one species, Najas flexilis, which was rare before, became abundant. This indicates that any follow up study must take into consideration seasonal variations before a comparison with this study is made.

Intensive Survey

The results of the intensive analysis are presented in Table 5. The exact locations are pictured in Figure 1. An indication of each species standing in the community was again determined by calculating an Importance Value. In this case it was: (relative frequency + relative biomass + relative density)/3.

Table 5. Results of the intensive quantitative analysis. The first number is the number of plants/ quadrat while the number in parentheses represents its biomass (grams/quadrat).
R.D. = relative density, R.B. = relative biomass, R.F. = relative frequency, I.V. = importance value.

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	Quadrat										R.D.	R.B.	R.F.	I.V.
	1	2	3	4	5	6	7	8	9	10				
Site Number One														
<u>Ceratophyllum</u>	0	0	2 (.4)	0	1 (.3)	0	0	0	0	0	--	--	--	--
	Biomass = .28 gms/m ²										No. of plants = 1.2/m ²			
Site Number Two														
<u>Sparganium fluctuans</u>	1 (.3)	5 (1.0)	2 (.1)	0	6 (.7)	0	7 (.8)	16 (2.3)	7 (1.1)	2 (.2)	8.4	11.5	33.3	17.7
<u>Potamogeton gramineus</u>	1 (1.5)	25 (6.8)	33 (9.6)	8 (2.0)	0	0	0	0	2 (.7)	9 (1.8)	14.4	36.3	25.4	25.3
<u>Sagittaria subulata</u>	44 (2.0)	57 (4.6)	39 (2.4)	68 (4.4)	46 (4.4)	48 (4.3)	51 (3.6)	14 (1.2)	25 (2.0)	26 (2.3)	77.2	52.2	41.3	56.8
	Biomass 24.6 gms/m ²										No. of plants 216.4/m ²			
Site Number Three														
<u>Sparganium fluctuans</u>	0	25 (7.6)	0	0	4 (.4)	4 (1.4)	0	0	0	0	15.2	38.4	18.7	24.1
<u>Potamogeton gramineus</u>	0	0	0	10 (1.1)	0	0	0	0	0	0	4.6	4.3	6.2	5.0
<u>Sagittaria subulata</u>	35 (1.6)	13 (1.4)	79 (8.0)	14 (1.1)	0	0	13 (1.1)	0	0	0	71.2	50.0	31.2	50.8
<u>Potamogeton sp.</u>	0	0	1 (.1)	0	0	0	1 (.4)	0	0	0	0.9	1.9	12.5	5.1
<u>Podostemum ceratophyllum</u>	0	7 (.2)	2 (.2)	2 (.1)	0	0	1 (.1)	0	0	0	5.5	2.3	25.0	10.9
<u>Potamogeton epihydrus</u>	0	0	5 (.7)	0	0	0	0	0	0	0	2.3	2.7	6.2	3.7
	Biomass 10 gms/m ²										No. of plants 100/m ²			

Table 5. Continued.

	Quadrat										R.D.	R.B.	R.F.	I.V.
	1	2	3	4	5	6	7	8	9	10				
Site Number Four														
<u>Sparganium fluctuans</u>	0	0	10 (2.5)	4 (1.6)	0	10 (4.4)	4 (2.5)	8 (.4)	5 (.9)	0	2.8	11.6	19.3	11.2
<u>Potamogeton gramineus</u>	0	25 (18.0)	0	0	50 (4.8)	0	0	0	0	0	5.3	21.5	6.4	11.0
<u>Sagittaria subulata</u>	104 (15.0)	0	4 (.6)	11 (1.1)	1	0	0	55 (3.0)	21 (3.8)	11 (.4)	14.6	22.5	22.5	19.8
<u>Potamogeton sp.</u>	1	0	0	14 (1.7)	1	0	0	14 (.3)	0	0	2.1	1.8	12.9	5.6
<u>Podostemum ceratophyllum</u>	0	0	0	128 (1.8)	400 (10.0)	70 (1.7)	96 (1.4)	0	0	0	49.0	13.3	12.9	25.0
<u>Potamogeton epihydrus</u>	0	0	27 (1.3)	20 (1.5)	0	16 (2.5)	14 (3.1)	30 (1.7)	20 (5.2)	90 (8.7)	15.3	22.7	22.5	20.1
<u>Fontinalis sp.</u>	0	0	0	0	0	0	0	0	0	150 (6.7)	10.6	6.3	3.2	6.7
	Biomass 42.6 gms/m ² No. of Plants 564.8/m ²													
Site Number Five														
<u>Sparganium fluctuans</u>	0	0	0	0	0	7 (2.0)	0	0	3 (.4)	0	2.1	3.7	12.5	6.1
<u>Potamogeton gramineus</u>	0	0	0	0	3 (.3)	0	0	0	0	0	0.6	.4	6.2	2.4
<u>Sagittaria subulata</u>	55 (5.9)	70 (6.6)	38 (1.2)	46 (9.9)	75 (6.9)	41 (4.0)	43 (5.6)	16 (5.3)	14 (2.6)	28 (4.0)	90.6	84.5	62.5	79.2
<u>Potamogeton sp.</u>	0	0	0	0	0	0	0	9 (2.2)	14 (3.1)	0	4.8	7.4	12.5	8.1
<u>Potamogeton epihydrus</u>	0	0	0	0	0	0	0	0	8 (2.0)	0	1.7	3.0	6.2	3.6
	Biomass 25.9 gms/m ² No. of Plants 189/m ²													

This aspect of the study indicates how plant abundance and diversity increased as the stream sections became more shallow, with a faster current velocity. The lowest abundance was at the deepest station, while the most diverse section was also the most shallow. Overall the dominant plants of the intensive survey were the same as the extensive survey: Sagittaria subulata, Sparganium fluctuans and Potamogeton gramineus.

Site 1 was a deep water area with little current and a muck bottom. The only plants collected were coontail (Ceratophyllum spp.).

Site 2 was a moderately shallow, fast water, area with a rubble-sand bottom. Only three species were collected from the quadrats and Sagittaria dominated the flora.

Site 3 was similar to Site 2 except the water was somewhat more shallow. Six species were collected with Sagittaria again being dominant.

Site 4 had a larger rubble bottom and was more shallow than the other sites. Seven species were present with riverweed (Podostomum ceratophyllum) being the most important.

Site 5 was typical of much of the area below the proposed construction site. Five species were collected and Sagittaria was by far the dominant species.

Riparian Vegetation

The riparian vegetation of Twenty-five Mile Stream was primarily that of a central Maine deciduous swamp. The stream banks were generally low, but steep, and permitted frequent flooding. On these low banks the overstory was a mixture of red maple, sugar maple, basswood and ash. On higher banks, red oak, white birch and gray birch occurred. Along the high banks around the sewage treatment plant, balsam fir and hemlock were found.

The shrub layer was composed largely of alders with some arrowwood and holly mixed in down to the water's edge. Buttonbush and sweet gale crept into the water in the slower moving water. Overstory reproduction was not common along the shore which was to be expected because of the large size trees along the banks. Most of the reproduction was ash and gray birch, but fir was common where it occurred in the overstory.

Ferns were the predominant growth in the herbaceous layer. Sensitive fern and royal fern were the two predominant species and on many banks appeared to be a major factor in preventing erosion. Grass-like plants which included sedges and grasses were not identified to genera, but appeared to be mostly coarse grasses and sedges. These commonly occurred where the canopy was sparse or did not extend over the water's edge. Herbaceous plants that were not ferns or grass-like in growth were classified as forbes. Forbes were found practically the full length of the study area but were generally not abundant enough to be recorded. They were hard to evaluate because of their wide size ranges and diversity of types. Undoubtedly forbes were a significant part of the riparian vegetation but a more intensive survey would be required to place them in proper perspective.

Above Prairie Road a significant portion of the overstory was dead. I speculate that this was a result of alteration of the water level several years ago caused by the dam at Prairie Road.

EFFECT OF PROPOSED PROJECT

It is difficult to forecast the effects of habitat modification on a plant community so I would like to preface the following remarks with the statement that the predictions are made on the basis of an incomplete understanding of the ecology of stream macrophytes.

Generally a more diverse community was found in shallow, swifter flowing waters and construction plans to widen and deepen stream sections will probably decrease total plant abundance and diversity. This effect may be opposed by the planned drop box structure which will moderate flows and reduce stream bed scouring. Plant growths are presently so abundant that small alterations in average depth and current velocity should have little effect on the entire plant community.

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G

APPENDIX G

BENTHIC INVERTEBRATE STUDY

G-1

Environmental Studies of Twenty-five Mile Stream

Waldo County, Maine

1974-1975

Part B: Benthic Macroinvertebrates

Prepared for:

Watershed Planning Staff
Soil Conservation Service
United States Department of Agriculture
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Contract No: 211-ME-SCS-74

Abstract

A study of the benthic macroinvertebrates of four stream sections of Twenty-five Mile Stream, Waldo County, Maine, was conducted from July 1974 to August 1975. Its purpose was to provide information on the ecology of the existing macroinvertebrate communities in order to assess the impact of the proposed construction project and to provide baseline data which can be compared with a post-construction study. One hundred twelve samples were taken by S.C.U.B.A. divers using both artificial substrates and a modified Hess bottom sampler. A comparison of the efficiency of the two sampling methods was made. Seasonal changes in the benthic community structure and differences among sampling stations were analyzed by examining differences in the individual species and by calculating species diversity indices. Two community types were found to exist and were apparently determined by current velocity. An appraisal was given as to the effect of the proposed project on the benthic fauna.

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INTRODUCTION

Macroinvertebrate communities are increasingly being used to complement standard chemical and physical measurements in the management of inland waters. Physical and chemical tests are indeed important in the characterization of water quality but they do have limitations. Chiefly among these is that they do not detect occasional disturbances, and there is little agreement on which of a multitude of tests are important.

The biota, however, can be considered as an integration of all physical and chemical happenings that have occurred over a period of time. Periodic siltation, organic enrichment from croplands or sewage seepage, scouring by flooding, industrial effluents and other occasional occurrences will affect water quality and the composition of the biotic community. But it will not be noticed by physical or chemical analysis unless sampling is regular and the two happen to coincide.

Benthic invertebrates are considered to be particularly useful biological indicators of water quality because their life histories last one or more years and their lack of mobility restricts rapid movement. They are thus able to indicate an accumulated history of water quality. The macroinvertebrates are important members of the food web, and the success of higher forms such as fish are dependent upon their well being. They are also important in recycling nutrients within the aquatic ecosystem. The invertebrates perform essential functions in the dynamics of a stream ecosystem and by examining their condition an indication of the well being of the entire stream system can be made.

This study was conducted as part of a comprehensive water quality investigation of Twenty-five Mile Stream (Rabeni 1975a, 1975b). Its purpose was to determine benthic invertebrate community structure to the extent that the study could be reproduced at a later date to determine natural or man made changes. This year's work (1974-1975) was concerned with sampling methods, taxonomy and seasonal standing crop variations. Present and future work will more strongly emphasize determining those factors responsible for invertebrate distribution

Ultimately, a fuller understanding of the ecology of stream invertebrates and their relation to water quality should be realized and the outcomes of this study will be of value to other situations in Maine.

THE STUDY AREA

All collections were taken from Twenty-five Mile Stream, Waldo County, Maine. The site locations are given in Figure 1. Twenty-five Mile Stream is the main outlet of Lake Winnecook, a 2,528 acre warm water lake. In addition, waters from Sandy Stream enter Twenty-five Mile Stream near the lake's outlet. Information on ecological conditions of Lake Winnecook and land use within the watershed may be found in Rabeni (1974). Chemical and physical conditions of the stream have been determined (Rabeni 1975a) and an aquatic plant and riparian vegetation survey has been taken (Rabeni 1975b).

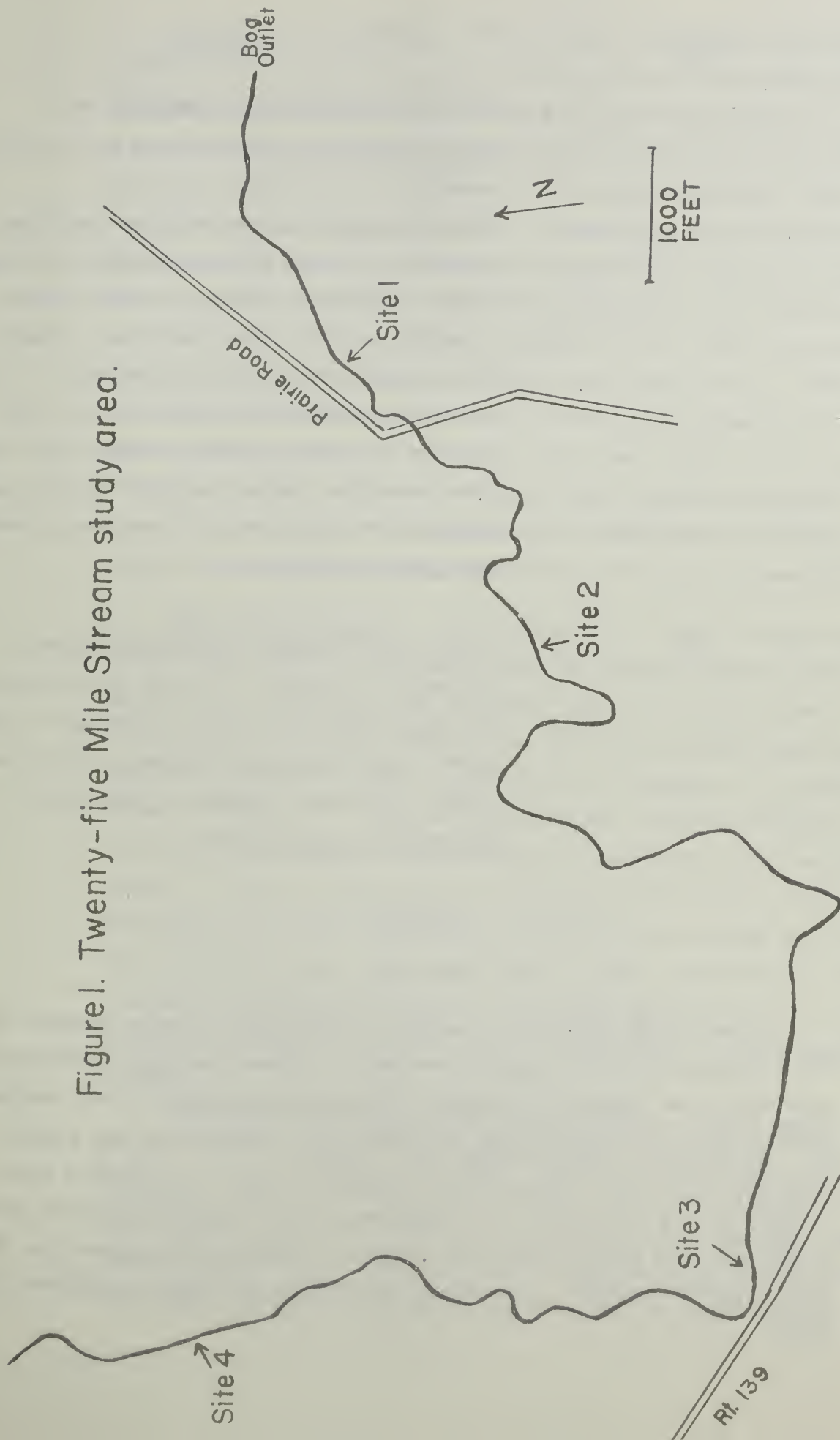
The stream flows through a deciduous lowland area which is principally forested with little or no human activities which could affect water quality. None of the stream within a mile of the outlet froze over completely during the winter although some icing near the shores occurred.

Site	Description
1	This site is just upstream from the position of the planned drop-box structure. Water depth averaged over ten feet and the current was always slow or negligible. The substrate was of the depositing type and consisted of detritus and organic muck. Very little benthic algae or aquatic plants were present in late summer.
2	This site is located directly opposite an abandoned camp, the only one within the study area. The stream was 40 feet wide at this point and averaged 40 inches in depth. The bottom consisted of small to medium sized rubble with sand below the rubble. A heavy

Table 1.--Physical characteristic of the four study sites.

	Site 1	Site 2	Site 3	Site 4
Mean width (m)	12	12	14	13
Mean depth (cm)	320	100	65	120
Mean current velocity (10 cm off bottom) cm/sec	3	20	21	27
Bottom type	muck	small rubble with sand	small rubble with sand	large- medium rubble with sand

Figure 1. Twenty-five Mile Stream study area.



Site

Description

3

growth of Potamogeton gramineus and Sparganium fluctuans occurred in the late summer.

This site was the most shallow sampling location. It was located 50 yards upstream from a tributary coming into the stream from beneath Rt. 139. The site averaged 30 in depth and it was 65 feet wide. Water velocity averaged 21 cm/sec and the substratum consisted of small rubble with sand interspersed. During the late summer aquatic plants were abundant with and were primarily Sagittaria subulata.

4

This site averaged the highest current velocity, 27 cm/sec. It was 45 feet wide and the bottom consisted of medium to large rubble with sand interspersed. There was a heavy late summer growth of riverweed, Podostemum ceratophyllum.

METHODS

Sampling

A persistent problem in benthic invertebrate stream studies is the inadequacy of the sampling methods. Either they are inefficient, unreliable, or highly selective. The appropriateness of any method depends upon the goal of the investigation. Because of the stated objectives of this study, sampling methods had to be selected that would give a good estimate of standing crop, be comparable both among sites and at a future date, and collect a significant percentage of the total species present. Two sampling methods were used to achieve these ends.

1. Artificial substrates: Commercially available wire baskets were filled with stones of a uniform size (construction grade $2\frac{1}{2}$ " (Figure 2) and placed on the stream bottoms for periods ranging from 60 days to six months. A basket was retrieved by placing a fine (#60) nylon mesh bag around it and lifting it out into a wash tub. The stones were then individually cleaned. The washings were concentrated through a #30 mesh screen and preserved to five percent formalin. This method is similar to previously published water quality studies by Anderson and Mason (1968), Benfield et al. (1974) Crossman and Cairns (1974, Dickson et al. (1971), and Mason et al. (1970). It is a method recommended by the United States Environmental Protection Agency (Weber 1974). The baskets have been shown to be somewhat selective in the ratios of organisms that colonize them but they do have the advantages of eliminating the substratum variable, collecting large numbers of organisms, and making sites more comparable.

2. Hess Bottom Sampler: This apparatus is used to take an invertebrate sample from a prescribed area of stream bottom ($1/16 \text{ m}^2$). It is an efficient standing crop estimator where it can be used. Unfortunately, as bottom rubble size increases beyond large grapefruit size, the sampler becomes inefficient or unusable. The sampler is shown in Figure 2. This particular model has been modified to be used in water of any depth. The biologist inserts his arm through the sleeve at the top, disturbs the enclosed substratum and the dislodged organisms and other debris are carried by the current into the detachable collecting bag. The collection is then prepared for later analysis as previously stated. The depth of the water at each sampling site required the use of S.C.U.B.A. or snorkel for both sampling methods.

All samples were preserved in the field. Later, each sample was picked over to separate the organisms from the debris. Very little taxonomic work on benthic invertebrates has been conducted in Maine and taxonomic keys and reference collections are lacking. Species identifications were made as often as possible but often genus was the lowest category that an organism could be identified to with any

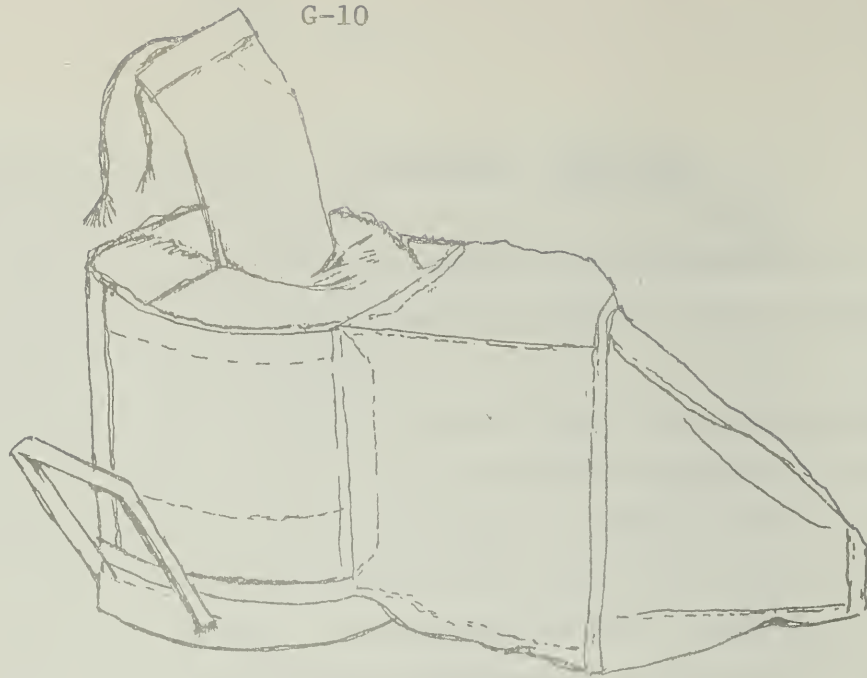


Figure 2a. Modified Hess bottom sampler



Figure 2b. Artificial substrate

degree of certainty. Taxonomic keys that were used are listed in the bibliography and the reference collection from this study is housed in the Department of Entomology, University of Maine, Orono.

Sampling was conducted at all sites in September 1974, May 1975, June 1975 and July 1975. A December sampling was abandoned when a problem developed with the SCUBA diver's regulator freezing. At each site during each sampling period four artificial substrate samples and three Hess bottom samples were taken.

Data Analysis

Indicator Organisms

One approach used to analyze the results requires the identification of each taxa to the species level whenever possible. This information is of value to evaluate water quality changes. Rush (1974) has shown how even "minor" shifts in water quality can alter the species composition within the same genera. Species level identifications are being increasingly used to classify indicator organisms: i. e., those organisms sensitive to water quality changes. Unfortunately species level taxonomic keys are unavailable for several invertebrate groups found in Maine. Many of the invertebrates in this study remain identified only to genus but current and future work should reduce this number.

Diversity in Stream Communities: Analytical tools that reduce large masses of data and species lists into a more easily handled form have become increasingly used in recent years. One common measure is the species diversity index. Its use is based upon the common condition that in natural undisturbed streams there are large numbers of species with no one or few species present in great abundance. There are a few species with a lot of individuals and a lot of species with a few individuals. Maximum diversity would exist when there are a large number of different species, each with one individual. Minimum diversity would occur when all individuals in a community belong to the same species.

Once the stream system is disturbed conditions may become unfavorable for many species while they are enhanced for a few.

Diversity of the stream is then reduced. It must be emphasized that there are naturally occurring ranges of diversity and human activities or disturbances may actually increase it. For example, it is possible that flow stabilization which reduces periodic scouring and drying could allow a more diverse assemblage of invertebrates to exist. In any event, this study should determine baseline diversity of relatively undisturbed areas and provide good comparison data for a later study.

The literature is replete with species diversity indices calculated in a number of ways. The methods used in this study are those recommended by the United States Environmental Protection Agency (Weber 1973). One is an index using information theory and is commonly called the Shannon-Weiner function:

$$\bar{H} = - \sum (p_i) (\log_2 p_i)$$

where:

H = index of species diversity

p_i = proportion of total sample belonging to i th species

The diversity as calculated here takes into account and is affected both by richness of species and by the distribution of individuals among the species.

A further step is to compare the calculated diversity index with a hypothetical maximum diversity for that particular sample. This is a method to evaluate the component of diversity due to the distribution of individuals among the species. The question being asked is: what would the species diversity of the sample be if all species were equal in abundance? It is: $H_{\max} = \log_2 S$. Equitability is therefore: $E = \bar{H}/H_{\max}$

Where S = number of species in the community

\bar{H} = observed species diversity

H_{\max} = maximum species diversity possible

Diversity was calculated for all samples to take into account variables in site, season and sampling methods.

RESULTS AND DISCUSSION

Community Diversity

The Environmental Protection Agency considers species diversity values of over 3 to be from unpolluted streams and values less than 1 to be from polluted streams (Weber 1973). There was no indication of any recent detrimental human activities at any of the stream sites and the values that were obtained may be considered to be the result of entirely natural causes.

Species diversity values ranged from 1.7 to 4.3, but averaged between 2.5 and 3.7 (Table 2). The lowest values were consistently obtained from Site 1, while Sites 2, 3, and 4 had similar and higher values. The low values of Site 1 were undoubtedly a reflection of its deep waters, slow current velocity, and soft substratum. The high values of the other three sites indicate benthic invertebrate communities of a clean-water, swift stream.

No seasonal patterns among the sites were evident. The average diversity index for each month at each site was very similar.

Diversity indices were similar for the two sampling methods. The only major difference was that the average Hess sample diversity was considerably lower than the artificial substrate diversity index for Site 1 (2.5 vs 3.1). This may be because the artificial substrate provides the invertebrates a place of attachment which is unnatural and which would otherwise not be found in that habitat.

The equitability index for all samples using both sampling methods ranged from 0.51 to 0.84, but was usually in the 0.65-0.75 range. In contrast to the species diversity values, equitability values for Site 1 did not average less than the other sites.

Community Structure

Sixty-four artificial substrate samples and 48 Hess bottom samples yielded 16,860 invertebrates. The two sampling methods did not always collect the same number or proportions of invertebrates, so it will be more informative to consider the sampling techniques separately.

Table 2.--Species diversity and equitability calculations for the two sampling methods. The first value is in the diversity index while the value in parenthesis is equitability.

Site	Artificial Substrates				X
	September	May	June	July	
1	3.7(0.83)	3.4(0.71)	2.5(0.55)	2.8(0.71)	3.1(0.70)
2	2.9(0.65)	3.5(0.65)	3.2(0.64)	3.2(0.67)	3.2(0.65)
3	3.6(0.64)	3.6(0.66)	4.0(0.72)	3.9(0.76)	3.7(0.69)
4	3.6(0.51)	3.5(0.64)	4.0(0.74)	3.8(0.77)	3.7(0.65)
Hess Sampler					
1	1.7(0.64)	3.9(0.84)	2.1(0.81)	2.3(0.81)	2.5(0.77)
2	3.0(0.65)	4.0(0.72)	3.9(0.80)	3.1(0.76)	3.5(0.73)
3	3.6(0.76)	3.4(0.64)	3.5(0.66)	3.5(0.77)	3.5(0.70)
4	3.7(0.77)	2.8(0.66)	4.2(0.84)	4.3(0.75)	3.7(0.75)

Table 3.-- Mean number of invertebrates collected by two sampling methods.

Site	1	2	3	4
Artificial substrates	62	273	366	299
Hess sampler	22	73	128	80

Artificial Substrates: Three insect orders and a group of non-insect invertebrates comprized the bulk of the collections. Caddisflies (Trichoptera) were most abundant and ranged from 24-55% of the total organisms collected. Non-insects, primarily snails and fingernail clams, were next in abundance and ranged from 12-48% of the total organisms. Mayflies (Ephemeroptera) and non-biting midges (Diptera: Chironomidae) each averaged 18% of the total collections. Stoneflies (Plecoptera), dragonflies (Odonata) and riffle beetles (Coleoptera: Elmidae) were all present in low densities.

Hess Bottom Sampler: Non-insect invertebrates, primarily the snail Amnicola, and the fingernail clam Musculium, were the dominant taxa and ranged from 41-91% of the total fauna in the collections. Mayflies were second in abundance and ranged from 4-23% of the total fauna while the non-biting midges were less abundant.

Both sampling methods showed a similar relative abundance of invertebrates among the study streams. Site 1 averaged the lowest densities of invertebrates while Site 3 contained the highest (Table 4).

Spatial Distribution

The invertebrate communities from Twenty-five Mile Stream can be divided into two groups. One group was present at Site 1 which has deep, slow flowing, waters and a depositing substratum. The other community type was found at the remaining three sites which had similar depths, faster current velocities, and rubble substrata.

Trichoptera(Caddisflies): The net-spinning caddisflies of the family Hydropsychidae, Macronemum zebratum, Cheumatopsyche, and Hydropsyche were rare at Site 1 but abundant and evenly distributed at Sites 2, 3 and 4. Psychomyiid caddisflies, Platycentropus, Polycentropus, Neureclipsis, and Nyctiophylax, spin elongated trumpet shaped food gathering nets that require a minimum current velocity to function properly. These genera were heavily concentrated in Sites 2, 3 and 4 but were also found at Site 1. This indicates the minimum current velocity at Site 1 is acceptable, if not optimum. The genus Chimarra also spins an elongated net and was represented by two species in Twenty-five Mile Stream. C. obscura was the most abundant species and

Table 4.--Mean number of invertebrates by major groups from each sampling site for four sampling periods collected by artificial substrates. No. = mean of 16 artificial substrates; % = percentage of total fauna from that site.

	Site 1		Site 2		Site 3		Site 4	
	No.	%	No.	%	No.	%	No.	%
Trichoptera (Caddisflies)	6	26	114	56	106	31	66	23
Plecoptera (Stoneflies)	0	0	2	1	7	2	13	5
Diptera (True flies)	4	18	46	23	52	15	52	18
Ephemeroptera (Mayflies)	1	5	9	4	82	23	111	39
Odonata (Dragonflies)	1	4	5	2	7	2	4	1
Coleoptera (Beetles)	0	0	2	1	8	2	4	1
Other insects	1	3	2	1	1	1	3	1
Non-insects	11	45	24	11	79	24	35	12

Table 5.--Mean number of invertebrates by major groups from each sampling site for four sampling periods collected by Hess bottom sampler. No. = mean of 12 Hess samples; % = percentage of total fauna from that site.

	Site 1		Site 2		Site 3		Site 4	
	No.	%	No.	%	No.	%	No.	%
Trichoptera (Caddisflies)	1	3	18	34	15	14	8	10
Plecoptera (Stoneflies)	0	0	1	1	1	1	2	2
Diptera (True flies)	1	2	3	5	1	1	3	3
Ephemeroptera (Mayflies)	1	4	10	20	20	19	18	23
Odonata (Dragonflies)	0	0	1	1	5	4	1	1
Coleoptera (Beetles)	0	0	1	3	15	14	13	16
Other insects	1	1	1	1	1	1	2	2
Non-insects	16	91	17	34	52	47	333	41

was found at Sites 2, 3 and 4. C. aterrima was found in small numbers at stations 3 and 4. Other caddisflies that were found only in the faster water, shallower stations, were Brachycentrus and Lepidostoma.

Plecoptera (Stoneflies): No stoneflies were collected at Site 1. The current velocity was either too slow or the substratum inappropriate. Four species, Acroneuria lycorias, Perlesta placida, Alloperla spp., and Isoperla spp. were evenly distributed at Sites 2, 3 and 4. Phasganophora capita was found only at Site 3 and 4 and Paragnetina media was found only at Site 4.

Ephemeroptera (Mayflies): Sixteen species of mayflies were collected during the study. This order was also heavily concentrated in Sites 2, 3 and 4. The Genus Ephemerella was represented by eight species. E. invaria was most common and was found in high densities at all sites except Site 1. E. bicolor was the only species of this genus found at Site 1. The genus Paraleptophlebia is ubiquitous in Maine streams. P. mollis and P. volitans were collected. They were both evenly distributed at Sites 2, 3 and 4. Another common genus, Stenonema, had two species in Twenty-five Mile Stream. S. smithae was the most common insect of the entire study. It was found at all collection sites.

Two genera of the family Caenidae were collected. Caenis and Tricorythodes are typically associated with silted, depositional type substrates. They were not, however, collected at Site 1 which may indicate either too soft a substratum or too slow a current.

The members of the family Ephemeridae frequent sand, gravel, and silt substrates in Maine streams and rivers. The habitat of Twenty-five Mile Stream would appear appropriate but Ephoron leucon and Ephemera simulans were found only in small numbers at Site 3. Although the substratum is appropriate, current velocity may be at times too strong and cause the substratum to shift.

Baetid mayflies have a streamlined shape and are vigorous swimmers that inhabit swift waters. Baetis, Centroptilum, and Isonychia were fairly evenly distributed in Sites 2, 3 and 4.

Odonata (Dragonflies and Damselflies): These organisms were collected in small numbers in all the sites. Six species of dragonflies and two species of Damselflies were fairly regularly distributed. This group is not morphologically adapted to living in swift currents but these particular species do quite well.

Coleoptera (Beetles): This group was dominated by one species of riffle beetle, Stenelmis crenata. It showed a preference for Sites 2, 3 and 4.

Diptera (True flies): The dominant dipterans were the non-biting midges (Chironomidae). Eight genera were collected. Conchapelopia and Microtendipes were found at all collection sites. Harnischia was collected only at Site 1. The remaining genera were collected from Sites 2, 3 or 4.

Magaloptera (Alderflies and Dobsonflies): Negronia and Sialis were collected in small numbers at Sites 2, 3 and 4.

Non-insects (Snails, Clams, Leeches, Worms): This diverse group was the most evenly distributed throughout the stream. Because of the absence of several insect forms at Site 1, the non-insects made up a much higher percentage there than at the other sites.

Four genera of gastropods were present with Amnicola being the most abundant. Small fingernail clams (Musculium) and large freshwater clams (Margaritifera margaritifera) were evenly distributed throughout the stream.

Leeches were most abundant at Site 1 while aquatic earthworms, oligochaetes, were common at all sites.

Table 6.--The abundance and distribution of the invertebrate fauna of Twenty-five Mile Stream based upon the mean number of organisms per sample. (A) = 1, (B) = 1-10, (C) = 11-25, (D) = 26-50, (E) = 51-100. The first letter is the mean of 16 artificial substrates from four sampling periods while the second letter in is the mean of 12 Hess bottom samples from four sampling periods.

	Site 1	Site 2	Site 3	Site 4
INSECTS				
Trichoptera				
Hydropsychidae				
<u>Macronemum zebratum</u>		B(A)	B(A)	A
<u>Cheumatopsyche</u>	A	D(B)	C(B)	C(B)
<u>Hydropsyche</u>		B(A)	C(B)	B(A)
Hydroptilidae				
<u>Agralea</u>				A
<u>Ithytrichia</u>		(A)		A
Limnephilidae				
<u>Pycnopsyche</u>	A(A)	C(B)	B(B)	B(B)
Psychomyiidae				
<u>Platycentropus</u>	A			
<u>Polycentropus</u>	B(A)	C(B)	B(A)	B(B)
<u>Neureclipsis</u>	B	C(B)	C(A)	C(A)
<u>Nyctiophylax</u>	A	(A)		
<u>Psycomyia</u>			(A)	
Philopotomidae				
<u>Chimarra aterrima</u>			A	A
<u>C. obscura</u>		A	D	B(A)
Leptoceridae				
<u>Arthripsodes</u>	A	A	A	A(A)
<u>Leptocella</u>				
Helicopsychidae				
<u>Helicopsyche</u>	A	(A) A(A)	A(A) A(A)	(A) A(A)
Lepidostomatidae				
<u>Lepidostoma</u>			A(A)	A
<u>Unknown</u>		A		
Brachycentridae				
<u>Brachycentrus numerosis</u>		(B)	A(B)	A(B)

Table 6.--Continued

	Site 1	Site 2	Site 3	Site 4
LEPIDOPTERA	A		A	(B)
Plecoptera				
Leuctridae				
<u>Leuctra</u>		A(A)	B(A)	A(A)
Perlidae				
<u>Phasganophora capita</u>			A(A)	B(A)
<u>Acroneuria lycorias</u>		A	B(A)	B(A)
<u>Perlesta placida</u>		(A)	A(A)	B(A)
<u>Paragnetina media</u>				A
Chloroperlidae				
<u>Alloperla</u>		A	A	A
Perlodidae				
<u>Isoperla nana</u>		A	A	(A)
EPHEMEROPTERA				
Caenidae				
<u>Caenis</u> spp.			(A)	
<u>Tricorythodes</u>		A	A(A)	B(A)
Ephemerellidae				
<u>Ephemerella bicolor</u>	A	A		
<u>E. cornuta</u>			(A)	
<u>E. needhami</u>		(A)	(A)	
<u>E. serrata</u> (gp.)			B(B)	B(A)
<u>E. invaria</u>		A(A)	B(B)	B(B)
<u>E. spp.</u>		A(A)	A(A)	A(A)
Leptophlebiidae				
<u>Paraleptophlebia mollis</u>		B	B(A)	A(A)
<u>P. volitans</u>		A	B(A)	B(A)
<u>Leptophlebia</u>		A	A	
Ephemeridae				
<u>Ephoron levcon</u>			A	
<u>Ephemera simulians</u>			A(A)	
Heptageniidae				
<u>Stenonema fuseum</u>		A		
<u>S. smithae</u>	B	E(B)	E(C)	E(B)
<u>S. spp.</u> (very small)			A	A

Table 6.--Continued

	Site 1	Site 2	Site 3	Site 4
Baetidae				
<u>Baetis</u>		B(B)	B(B)	B(B)
<u>Centroptilum</u>	(A)		(A)	A
<u>Isonychia</u>		A	B	B
Other (very small)		B(A)	B(B)	B(B)
ODONATA				
Aeschnidae				
<u>Boyeria grafiana</u>		A	A	A
Gomphidae				
<u>Gomphus</u>		(A)	A(A)	
Other	A		A	
Libellulidae				
<u>Macromia</u>	A	A	A	
Agrionidae				
<u>Agrion</u>		A	B	A
Coenagrionidae				
<u>Argia</u>		B(A)	B(B)	B(A)
Other (very small)	A	A(A)	B(A)	A(A)
COLEOPTERA				
Elmidae				
<u>Psephenus herriki</u>			B(B)	
<u>Stenelmis crenata</u> (gp.)	A	B(B)	B(C)	B(C)
DIPTERA			(A)	
T i p u l i d a e				(A)
Rhagionidae				
<u>Atherix variegata</u>		(A)	B	B(A)
Ceratopogonidae			A	A
Simuliidae		A(A/A)	A(A)	A(A)
Empididae		A	A(A)	A(A)

Table 6.--Continued

	Site 1	Site 2	Site 3	Site 4
Chironomidae				
<u>Conchapelopia</u>	(A)	B	B	B
<u>Cryptochironomus</u>		A	B(A)	
<u>Microtendipes</u>	A	C(A)	B(B)	B(B)
<u>Orthocladius</u>		(A)	A(A)	B(A)
<u>Polypedilum</u>		(A)		
<u>Procladius</u>		(A)		
<u>Tanytarsus</u>		A(A)	A	A
<u>Harnischia</u>	B(B)			
Other	A	(A)	A(A)	
MEGALOPTERA				
Corydalidae				
<u>Negronia</u>	A	A	A(A)	B(A)
Sialidae				
<u>Sialis</u>	A	B(A)	A(A)	B(B)
HEMIPTERA				
Belostomatidae				
<u>Lethocerus</u>	A	A		
NON-INSECTS				
CRUSTACEA				
<u>Hyalella azteca</u>	B(B)	A(A)	A(A)	A(B)
Decapods		A	A	
GASTROPODA				
<u>Helisoma</u>	B(A)	A	A	A
<u>Amnicola</u>	C(B)	B(B)	C(C)	C(C)
<u>Campeloma</u>	(B)	(A)	(A)	(A)
<u>Ferrissia</u>	A	(A)	(A)	(A)
PELECYPODA				
<u>Musculium</u>	B(B)	C(C)	D(C)	C(B)
<u>Margaritifera</u>	(A)		(A)	(A)
OLIGOCHAETES	B(B)	B(B)	B(B)	A(A)
HIRUDINEA				
<u>Helobdella stagnalis</u>	B(A)	A		
<u>Erpobdella</u>	B(A)	A	A(A)	A
PLANARIA	B(A)	B	B(A)	B(A)

Factors Affecting Invertebrate Distribution

The areas of Twenty-five Mile Stream that were sampled during this study show two basic invertebrate community types. On the basis of the mean number of taxa and individuals of invertebrates collected, a substantial difference is evident between Site 1 and the other sites. It has been noted that there are no human settlements or activities near Twenty-five Mile Stream, so the differences found in the benthic communities must be due to natural conditions. It is important to examine the factors determining the abundance and distribution of many of the invertebrates so that the impact on the fauna of the proposed construction project may be assessed.

First I will summarize the invertebrate differences between Site 1 and the other sites. Site 1 generally had a lower species diversity and equitability index. It also contained the lowest organism diversity of any of the sites. The Site 1 community was dominated by non-insects and contained the majority of crustacea, snails, leeches and flat worms. Stoneflies, mayflies, and several species of caddisflies were rare or absent from Site 1 but common at all the other sites. Sites 2, 3 and 4 were very similar in community structure and showed typical fauna of a clean water stream with moderate current. The communities were characteristic of larger, deeper rivers of Maine in that fingernail clams and several species of snails were common.

Several physical and chemical measurements were taken monthly below Site 1 and below Site 4. Analysis of these data was made to determine whether some causal relationship could be discovered which would explain invertebrate distributions. Water temperature, dissolved oxygen, pH, hardness, alkalinity, conductivity, turbidity, suspended solids, water color, total and fecal coliform bacteria, total phosphorus, nitrate-nitrogen, and ammonia, all showed very little variation from one end of the study area to the other, and were therefore discounted as influencing invertebrate distribution. Attention was then turned to the more obvious factors of current velocity and substratum.

The faunal composition of Site 1 can be explained by the fact that it was located where the current was slow and the substratum was the depositing type. The habitat was conducive to burrowing forms for taxa which have no adaptations or a strong current.

The other three sites had a moderate current velocity and an eroding type substrate. Typical riffle forms were common. In addition, the abundance of snails, fingernail clams and crustacea indicated that the current velocity did not often become so severe so as to scour the bottom.

Site 3 had the highest average organism diversities as collected by both artificial substrates and the Hess sampler. It also was the most shallow sampling site and had a lower mean current velocity than either Site 2 or Site 4. The influence of the ranges of water velocities and depths found at Sites 2, 3, 4 on invertebrate distribution is being more closely investigated in a present study.

COMPARISON OF SAMPLING METHODS

No one sampling method for collecting stream invertebrates has yet gained wide acceptance to the exclusion of others among stream ecologists. Two methods were used during this study to take advantage of the best qualities of each. The Hess bottom sampler probably obtains the most representative sample from the natural stream bottom. The artificial substrates standardize the substratum variable and collect a higher density of individuals, but the relative abundance of the species may be altered.

The artificial substrates collected on the average three times more individuals than did the Hess bottom sampler (Table 6). Generally the artificial substrate contained higher proportions of caddisflies and stoneflies while the Hess sampler contained higher proportions of non-insects and riffle beetles. These differences appear directly related to the life habit of the organism. If the organism burrows or prefers a bit of siltation out of the main force of the current it will be collected more often in the Hess sampler. If the organism prefers a faster current free of detritus and silt, the rocks in the artificial substrate will provide a better micro-habitat than the natural stream bottom.

Future sampling effort may be reduced if it is determined how efficient each sampler is. For this purpose a comparison of the two methods was made for the June 1975 collection.

Table 7 shows a comparison of the efficiency of the two methods in collecting different taxa. The artificial substrate tended to pick up more taxa than did the bottom sampler but both methods had low standard deviations. This indicates that they are both efficient qualitative collectors, although they collect slightly different things.

Table 8 shows a comparison of the efficiency of the two sampling methods in their ability to collect numbers of individuals. While the artificial substrate collected much higher numbers of invertebrates, the variation between samples, as measured by the standard deviation, was slightly lower using the Hess bottom sampler.

Another test of the efficiency of the sampling methods is to determine how many samples of each type are necessary to be 95% confident that the mean number of taxa or individuals are within a certain percentage (usually 25% in benthic studies) of their true values. The method of Elliott (1971), developed especially for benthic invertebrates, was used. The results are given in the last column of Table 7 and Table 8.

Both sampling devices are so efficient that in all cases only one or two samples of either type was necessary to be 95% confident that the mean number of taxa was within 25% of the true value (actually the precision was much greater). To obtain the same precision for the mean number of organisms, only one sample was necessary in the majority of cases. Site 4 required three artificial substrates and four Hess samples, while Site 1 required 8 artificial substrates.

Using both sampling techniques in this study gave information neither could have supplied alone. Both methods appear to be efficient and in future work replications of the artificial substrates could be reduced from four to three with little loss of information.

Table 7.--Number of taxa collected from each type sampler in June 1975.

Site	Sampler	Sample Replicate			Mean	Standard deviation	No. samples needed to be within 25% of true mean
		1	2	3			
1	Artificial Substrates	13	11	17	10	3.0	2
	Hess	8	7	9	8	1.0	1
2	Artificial Substrates	21	19	16	19	2.5	1
	Hess	14	12	14	13	1.1	1
3	Artificial Substrates	32	28	26	29	3.0	1
	Hess	21	15	23	20	4.1	1
4	Artificial Substrates	26	26	31	28	2.8	1
	Hess	12	16	22	17	5.0	2

Table 8.--Number of organisms collected from each type sampler in September 1974.

Site	Sampler	Sample Replicate			Mean	Standard deviation	No. samples needed to be within 25% of true mean
		1	2	3			
1	Artificial Substrates	80	52	22	51	29	8
	Hess	13	19	15	16	3	1
2	Artificial Substrates	194	278	258	226	32	1
	Hess	47	40	33	40	7	1
3	Artificial Substrates	389	255	328	324	67	1
	Hess	74	119	106	99	23	1
4	Artificial Substrates	403	198	251	284	106	3
	Hess	46	101	106	84	33	4

CONCLUSIONS

The benthic invertebrate communities of Twenty-five Mile Stream are to a great extent determined by water depth, current velocity and substratum type.

The invertebrate community of Site 1 should be unaffected by the planned construction because the slow current velocity has already produced a soft substrate which accounts for the high proportions of non-insect invertebrates.

Sites 2, 3, and 4 all show similar highly diverse faunas. They contain what is considered the typical riffle fauna; caddisflies, mayflies, stoneflies, and riffle beetles. Because the sites averaged three feet in depth they also contained many species normally associated with deep rivers. This included abundant fingernail clams, several species of snails and several crustacea.

The result of the proposed construction project will be to widen and deepen areas of the stream. Because elements of a deeper river fauna are already present, the project should have little effect on the invertebrate community as long as sufficient current velocity is maintained to prevent siltation. Otherwise, a condition similar to that present at Site 1 will result.

The sampling frequency and the number of replicates used in the study appear to be a reasonable compromise between cost and accuracy. The two sampling methods complement each other and provide more information than either method used alone.

This year's study provided valuable baseline data on the existing abundance and distribution of the stream invertebrates. A study in progress (1975-76) will determine year to year standing crop variations as well as more precisely defining ecological requirements of the invertebrate populations. The goal is a meaningful, comprehensive pre-construction survey which can be compared with a post-construction study to determine minor community structure changes caused by habitat alterations.

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LIST OF APPENDIXES

Appendix A - Total fauna collected by artificial substrates

Appendix B - Total fauna collected by Hess bottom sampler

Appendix A.--Total fauna collected by artificial substrates. Each value is the mean of four replicates.

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
TRICHOPTERA																
Hydropsychidae																
<u>Macronemum zebratum</u>			0.7													
<u>Cheumatopsyche</u> spp.	0.2	32.2	18.0	10.0	1.3	78.5	37.0	11.3	0.3	2.3	2.3	27.0	11.7	11.0	2.0	2.0
<u>Hydropsyche</u> spp.		0.2	0.7	1.2		3.7	14.5	2.0	0.3	32.0	17.5		56.5	23.0	51.2	51.2
													0.5	10.0	2.7	2.7
Hydroptilidae																
<u>Agralea</u> spp.								0.3				0.5				
Limnephilidae																
<u>Pycnopsyche</u> spp.					15.7	8.2	6.0	6.0	0.5	53.3	16.6	2.0	0.6	7.0	1.0	0.2
Nyctiophylax spp.																
<u>Polycentropus</u> spp.	7.2	20.2	4.2	6.7	0.2	0.2	7.0		0.2	6.0	4.0	3.0	8.2	13.0	9.5	9.5
<u>Neureclipsis</u> spp.	4.2	7.7	10.0	9.0	4.6	25.0	15.2	8.0	0.7	10.0	14.6	9.0	38.0	12.0	38.5	38.5
<u>Platycentropus</u> spp.					2.3	18.5	9.0		0.2							
					1.3											
Philopotomidae																
<u>Chimarra aterrima</u>			0.5				1.5					2.2			0.7	0.7
<u>C. obscura</u>			12.7	4.2	1.2	59.0	11.0			8.6	1.0		0.7	43.0	8.5	8.5
Leptoceridae																
<u>Arthropoides</u> spp.	0.2		0.2	1.2	0.2	0.2	2.7	2.3							0.2	0.2
Helicopsychidae																
<u>Helicopsyche</u> spp.										0.6						
Lepidostomatidae																
<u>Lepidostoma</u> spp.			1.0	0.5			1.0	0.3			0.6				0.5	0.5
UNKNOWN					0.5											
Brachycentridae																
<u>Brachycentrus numerosis</u>			0.2	0.7				1.3			0.6			1.0	0.2	0.2

Appendix A.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
LEPIDOPTERA	0.2			0.2												
PLECOPTERA																
Perlidae																
<u>Phasganophora capita</u>			0.2	4.2			2.2	4.6				2.2				1.2
<u>Acroneuria lycorias</u>				6.2	0.2		7.7	8.6			4.0	4.0				5.0
<u>Perlesta placida</u>	0.2	3.5					0.7	1.0			1.3	4.2		0.6		3.7
<u>Paragnetina media</u>												0.5				
Chloroperlidae																
<u>Alloperla</u> spp.			0.5	0.2												
Perlodidae																
<u>Isoperla nana</u>							0.2	0.5								G-34
Leuctridae																
<u>Leuctra</u> spp.					1.0		0.5	5.3			0.6	4.0	0.7			0.5
EPHEMEROPTERA																
Caenidae																
<u>Tricorythoedes</u> spp.												2.0		1.5	2.0	2.2
Ephemerellidae																
<u>Ephemerella bicolor</u>	0.2	0.2														
<u>E. cornuta</u>											0.6					
<u>E. needhami</u>											17.3	6.7		0.3		0.2
<u>E. serrata</u> (gp.)		1.5		1.7			11.2	1.6			1.3	4.2				
<u>E. invaria</u>				1.0	0.2		15.2	9.0			0.3	0.7				
<u>E. spp.</u>		0.2	0.5	0.2	0.2			0.3			0.3					0.7
Leptophlebiae																
<u>Paraleptophlebia mollis</u>					6.2		1.0	1.6			4.6			3.6		0.5
<u>P. volitans</u>												0.2		0.3		
<u>Leptophlebia</u> spp.	3.0	18.7		5.7	0.5						0.3					

Appendix A.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
Ephemeridae																
<u>Epheron leucon</u>							0.2									
<u>Ephemera simulans</u>																
Heptageniidae																
<u>Stenonema fuscum</u>						1.5										
<u>S. smithae</u>	1.0	101.2	116.0	145.2	3.3	87.2	69.5	78.0	0.2	39.6	61.3	70.2	32.0	35.6	58.7	
<u>S. spp. (very small)</u>														0.6	0.5	
Baetidae																
<u>Baetis spp.</u>		5.5	15.2	13.5			1.0	0.6			0.6	5.5	0.7	1.3	20.0	
<u>Centroptilum spp.</u>		24.2	14.0	10.5			0.2				1.0	3.5	1.7	3.3	3.2	
<u>Isonychia spp.</u>			4.7	7.2		0.7	18.5	26.3			1.3	5.5		2.3	0.2	1.2
ODONATA																
Too small to key	2.7	2.7	10.0	2.0		0.2	1.7			0.3	1.0	0.5		0.9		
Aeschnidae																
<u>Boyeria grafiana</u>		0.2	0.7	0.5			0.2	1.3			0.3	1.2		0.2		
<u>Basiaeschna janata</u>																
Gomphidae																
<u>Gomphus spp.</u>	0.2		0.7				0.5				0.3					
Libellulidae																
<u>Libellula</u>			0.2			0.3				0.2	0.6					
Agrionidae																
<u>Agrion spp.</u>			0.5			0.2	0.5	0.3			2.3				4.3	
Coenagrionidae																
<u>Argia spp.</u>	9.7	4.2	6.2			2.0	3.2	0.6		1.0		0.7	0.3	1.0	0.3	1.7

Appendix A.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
COLEOPTERA																
Elmidae																
<u>Phephenus herriki</u>			0.75				2.0				3.0			1.6		
<u>Stenelmis crenata</u>	1.7	3.2	1.7		4.5	13.2	6.6		2.6	4.3	6.0		1.0	3.3	1.7	
DIPTERA																
Rhagionidae																
<u>Atherix variegata</u>	0.7	1.0			1.7	2.6			2.0	0.7			0.3	1.0		
Ceratopogonidae									0.3	0.2						
Simuliidae	1.0	0.5	2.7						0.3							
Empididae					1.7	0.7	1.0									0.7
Chironomidae																
<u>Cryptochironomus spp.</u>					10.0				2.5							
<u>Microtendipes spp.</u>	2.0	8.0	1.0	1.5	32.0	5.0	3.1		30.0	2.5	40.0		30.0	8.5	35.5	
<u>Orthocladus spp.</u>			2.0	1.5		2.5				1.6	5.6				5.2	
<u>Tanytarsus spp.</u>					5.3					2.5	2.4		2.1	1.5	2.4	
<u>Conchapelopia spp.</u>	4.0	7.0	5.4		30.4	85.0	36.0		5.5	39.0	27.6		8.3	20.9	15.5	
<u>Harnischia spp.</u>					14.0											
Other			1.5	1.3					1.5					2.0		
MEGALOPTERA																
Corydalidae																
<u>Negronia spp.</u>					1.0	0.2	0.5	2.6	0.6		1.7		0.2		0.7	
Sialidae																
<u>Sialis spp.</u>	0.5	0.2	2.2		1.0	2.0			1.6	1.0	1.2		0.3	4.5		4.0

Appendix A.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
HEMIPTERA																
Belostomatidae																
<u>Lethocerus</u> spp.	0.2	1.2				0.3										
NON-INSECTS																
CRUSTACEA																
<u>Hyaella</u> azteca	12.5	0.2	0.2	1.5	0.6	0.5	0.2	3.0	0.2			0.5	0.3			0.5
DECAPOD	2.2	0.7	1.0		1.3	0.2	0.2	0.3	0.2	0.3			0.2	1.0	1.0	G-37
Gastropoda																
<u>Helisoma</u> spp.	2.4				0.6	0.2			0.5				2.6			
<u>Amnicola</u> spp.	10.7	6.5	3.7	35.2	14.6	3.7	2.0	5.6	34.5	5.6	11.3	23.0	19.0	3.2	18.0	9.7
<u>Cameloma</u>	0.5		0.2		1.6	0.7			5.2				6.6			
<u>Ferrissia</u> spp		0.5			0.3	0.2										
Pelecypoda																
<u>Musculium</u> spp.	6.0	2.2	15.5	0.5	8.6	31.7	164.5	36.0	6.2	14.3	35.0	10.7	17.3	3.5	1.0	1.0
Oligochaetes	1.0	1.5	0.5	0.5	4.6	1.5	4.0	0.3	2.0	2.3	1.0	0.7	1.6	0.7		
Hirudinea	5.2				2.6	0.5			0.7				2.6			
<u>Helobdella stagnalis</u>	2.2	0.5	0.7	0.2	0.3		0.5		1.5		0.3		5.6	0.5	0.3	
<u>Other leeches</u>																
Planaria	0.7		1.0	0.7	1.0	2.0	8.5	1.6	5.7	2.6	11.0	2.0	1.6	6.7	2.6	3.2

Appendix B.--Total fauna collected by Hess bottom sampler. Each value is the men of four replicates.

Species	September 1974			May 1975			June 1975			July 1975		
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
TRICHOPTERA												
Hydropsychidae												
<u>Macronemum zebratum</u>			1.6				0.3				0.3	0.3
<u>Cheumatopsyche</u> spp.	17.0	11.3	2.6		3.6	2.6	1.3		0.3	3.6	3.0	8.0
<u>Hydropsyche</u> spp.					1.0	0.6				3.3	1.6	6.0
Hydroptilidae												
<u>Agralea</u> sp.			1.0				1.0	0.6			0.3	2.0
<u>Ithytrichia</u> spp.									0.3		0.3	
Limnephilidae												
<u>Pycnopsyche</u> spp.					0.6	1.0	3.3	3.0	0.5	7.3	3.3	1.0
Psychomyiidae												
<u>Polycentropus</u> spp.	1.6	1.0	1.6		0.3	1.3	0.3			0.3	2.3	1.6
<u>Neureclipsis</u> spp.	3.6	0.3			0.3						1.3	1.0
<u>Nyctiophylax</u> spp.	0.6										0.3	2.6
<u>Psychomyia</u> spp.			1.0									
Philopotomidae												
<u>Chimarra aterrima</u>				0.3								
<u>C. obscura</u>							0.3	0.6				
Leptoceridae												
<u>Arthropoides</u> spp.			0.6									
<u>Leptocella</u> spp.												
Lepidostomatidae												
<u>Lepidostoma</u> spp.			0.3				0.3					
Brachycentridae												
<u>Brachycentrus numerosis</u>	10.3			0.3						1.6	0.3	1.3
										2.3	8.0	2.3
LEPIDOPTERA												

Appendix B.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
PLECOPTERA																
Perlidae																
<u>Phasganophora capita</u>			0.3	0.6				0.3				0.6				0.3
<u>Acroneuria lycorias</u>				0.6			0.3									
<u>Perlesta placida</u>								0.3		0.3	0.3	2.0				
Perlodidae																
<u>Isoperla nana</u>								0.3								
Leuctridae																
<u>Leuctra</u> spp.				0.3		2.0		0.3		0.3	1.3	0.6			0.6	
EPHEMEROPTERA																
Caenidae																
<u>Caenis</u> spp.																
<u>Tricorythoedes</u> spp.										1.3		0.3			0.3	1.0
Ephemerellidae																
<u>Ephemerella bicolor</u>														0.6		
<u>E. cornuta</u>								0.3								
<u>E. needhami</u>																
<u>E. serrata</u> (gp.)			2.3	0.3			1.0	0.3				1.3				1.3
<u>E. invaria</u>							4.0	5.3		2.0	0.3	0.6				
<u>E. spp.</u>			0.6			0.6	0.3	0.3		1.0	0.6					
Leptophlebiidae																
<u>Paraleptophlebia mollis</u>																
<u>P. volitans</u>			1.3	0.6			0.3			0.6	0.3	0.3			0.3	
Ephemeridae																
<u>Ephemera simulans</u>			1.3													
Heptageniidae																
<u>Stenonema smithae</u>	3.0	23.3	18.3		6.0	11.6	2.6		4.3	5.6	5.0		2.6			2.6

Appendix B.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
Raetidae		2.0	7.6	6.6			4.6				1.6	2.0		0.6	2.3	9.6
Baetis spp.		21.6	0.3	5.3		0.3		0.6			1.3	1.6			2.3	5.6
<u>Centroptilum</u> spp.					3.0						0.3					
ODONATA																
Too small to key		0.5	1.3	0.3							0.6	0.6				
Gomphidae																
<u>Gomphus</u> spp.			1.3			0.6					1.0					
Coenagrionidae																
<u>Argia</u> spp.			9.3	0.6			2.0	0.3		0.6	2.0	0.3		0.3	1.6	1.6
HEMIPTERA																
Corixidae																
COLEOPTERA																
Elmidae																
<u>Psephenus</u> <u>herriki</u>			1.0					1.3			3.3				6.3	
<u>Stenelmis</u> <u>crenata</u>		2.6	15.3	8.6		0.3	6.9	8.6		1.6	8.3	12.1		0.6	17.0	21.0
DIPTERA																
Tipulidae																
Rhagionidae																
<u>Atherix</u> <u>variegata</u>				0.3				0.3				1.0		0.3		0.6
Simuliidae		2.3	0.3	0.3			0.3				0.6				1.6	1.6
Empididae							0.3	0.6								

Appendix B.--Continued

Species	September 1974				May 1975				June 1975				July 1975			
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
DIPTERA																
Chironomidae																
<u>Cryptochironomus</u> spp.							2.5									
<u>Microtendipes</u> spp.							2.0	1.0		1.0	4.4	2.3			3.3	3.3
<u>Orthocladus</u> spp.	0.5	2.0	1.0				2.0	1.0								
<u>Polypedilium</u> spp.	0.5	0.5	1.0			1.0	1.0									
<u>Procladius</u> spp.		2.5														
<u>Tanytarsus</u> spp.	1.6										2.6					
<u>Conchapelopia</u> spp.	0.5										3.3	3.4		10.0	2.2	
<u>Harnischia</u> spp.	1.3	16.0	2.0		2.0	7.5	3.6		1.0							0.3
Other				1.4												
Tipulidae														2.2		G-41
MEGALOPTERA																
Corydalidae																
<u>Negronia</u> spp.			0.6								0.6	1.3				1.6
Sialidae																
<u>Sialis</u> spp.	1.3	0.6	2.0				0.6				0.6	0.3		0.6	0.3	1.3
NON-INSECTS																
CRUSTACEA																
<u>Hyalella azteca</u>	0.6	0.3	1.3	5.0							0.6	0.6	2.0			3.0
DECAPODS																
									0.3	0.3				1.0		
Gastropoda																
<u>Helisoma</u> spp.											0.3					0.3
<u>Amnicola</u> spp.	0.6	2.6	18.3	7.6	3.0	4.6	10.6	39.0	5.0	6.0	18.6	19.6	4.0	4.0	5.0	24.0
<u>Campeloma</u> spp.					2.0		0.3		1.5	0.3			6.0			

Appendix B.--Continued

Species	September 1974			May 1975			June 1975			July 1975		
	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4	St#1	St#2	St#3	St#4
NON-INSECTS												
DECAPODS												
Pelecypoda												
Musculium spp.	4.3	8.0	50.6	3.3	5.0	18.0	61.0	10.0	5.0	4.6	23.3	2.6
Margaritifera												
Oligochaetes		1.0	2.6	0.6	1.0	0.3	2.6	0.3	2.0	1.0	2.3	1.3
Hirudinea												
Helobdella stagnalis					1.0							
Other Leeches	0.3				1.3		0.3					
Planaria				0.3	0.3		0.3	0.3		1.0	2.3	0.3



